

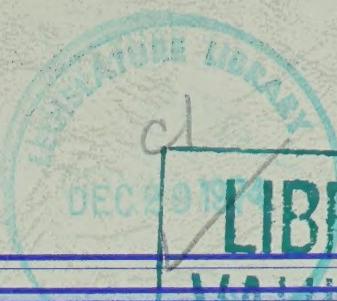
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REPORT ON THE APPLICATION FOR A PERMIT AUTHORIZING THE  
REMOVAL OF PROPANE FROM THE PROVINCE OF DOME PETROLEUM  
LIMITED AND PAN AMERICAN CANADA OIL COMPANY, LTD. UNDER  
THE GAS RESOURCES PRESERVATION ACT, 1956

NOVEMBER 1968

<Alberta>

OIL AND GAS CONSERVATION BOARD

603 SIXTH AVENUE SOUTH WEST • CALGARY 1, ALBERTA

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REMOVAL OF PROPANE FROM THE PROVINCE OF DOME PETROLEUM  
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## I INTRODUCTION

The application considered in this report was made pursuant to The Gas Resources Preservation Act, 1956, by Dome Petroleum Limited and Pan American Canada Oil Company, Ltd. and was for a permit authorizing the removal of propane from the Province. The permit applied for would be for a term of 30 years commencing November 1, 1969, would authorize the removal of daily, annual and 30-year volumes of propane of 15,000, 5,475,000 and 162,060,000 barrels respectively and would name some 10 plants from which the propane could be taken, including the proposed plant of Alberta Natural Gas Company to process gas passing through the Alberta Gas Trunk Line Company Limited's Foothills division.

The application was heard on July 4, 1968, by the Oil and Gas Conservation Board, with G. W. Govier, P. Eng., A. F. Manyluk, P. Eng. and Vernon Millard sitting.

### Appearances

The following appeared at the hearing:

	<u>Represented by</u>	<u>Abbreviation of name Used in Report</u>
Dome Petroleum Limited Pan American Canada Oil Company, Ltd.	W. E. Richards W. E. Richards	Dome Pan American
Alberta Natural Gas Company	R. L. Winton	Alberta Natural
Canadian Superior Oil Ltd.	R. C. MacDonald	Canadian Superior
Chemcell Limited	W. R. Sinclair, Q.C.	Chemcell
Interprovincial Pipe Line Company	H. A. Smith	Interprovincial
Board Staff	N. A. Macleod, Q.C. N. J. Lashuk, P. Eng. G. C. Watkins	

The applicants' witnesses were H. J. Blain, P. Eng., E. C. Sievwright, D. M. Wolcott, P. Eng. and R. G. Nicholls, P. Eng. Chemcell called R. F. Steele, P. Eng. as its witness.

Alberta Natural, Canadian Superior and Interprovincial appeared for the purposes of cross-examination and argument only.

Qualifications of Applicants

The Board is satisfied that the applicants qualify as such under section 5, subsection (1) of The Gas Resources Preservation Act, 1956, as they appear to have made arrangements with their respective affiliated companies and with Alberta Natural Gas Company to purchase or acquire property in a substantial part of the propane that would be removed from the Province under the permit for which application is made. Additionally, Dome produces some of the reserves from which propane would be extracted.

Date of Reserve Assessment and Period of Protection

The reserves assessed in this report are those as of May 31, 1968. The period for which the Board has assessed the requirement within the Province for propane is the 30-year period commencing June 1, 1968.

## II SUBMISSION OF THE APPLICANTS

The applicants asked the Board for a permit authorizing them to remove from Alberta 162,060,000 barrels of propane during the 30-year period commencing November 1, 1969. The rates of removal would be as follows:

<u>12 months beginning</u>	<u>Barrels per day</u>	<u>Barrels for 12-month period</u>
November 1, 1969	12,000	4,380,000
November 1, 1970	13,000	4,745,000
November 1, 1971	14,000	5,110,000
November 1, 1972 and each year thereafter	15,000	5,475,000

The major source of supply would be the plant to be constructed by Alberta Natural Gas Company on The Alberta Gas Trunk Line Company Limited pipe line near Cochrane. Propane, in some cases in modest quantities, would also be removed from the Edmonton Liquid Gas Plant and gas processing plants located at Kaybob South, Provost, Pembina, Vulcan, Gilby, Lobstick Easyford, Carson Creek and Carstairs.

Propane from the various plants would be moved to Edmonton and thence transported through the facilities of Interprovincial Pipe Line Company in a mixture consisting of propane, butanes and pentanes plus to markets in Eastern Canada and adjoining areas of the United States. Fractionation facilities would be located at Sarnia, Ontario, Superior, Wisconsin, and possibly Chicago, Illinois.

Reserves and Availability of Propane

The applicants introduced a study, prepared by Blain, Binnie and Mattheis Engineering Ltd., of the reserves and availability of propane in the Province. The reserves of propane were estimated to total 604.1 million barrels consisting of 381.3 million from existing plants processing gas already established, 89.3 million from future plants or future propane recovery facilities processing now known reserves of gas, and 133.5 million from three years growth of gas reserves at the historic rate of 2.5 trillion cubic feet per year.

The applicants predicted the potential supply of propane in Alberta to be some 42,000 barrels per day in 1968, increasing to about 63,000 barrels per day in 1986, then decreasing to 37,000 barrels per day in 1997, the end of the 30-year period. The estimate was based on the assumptions that future plants or deep cut facilities would be built as required and that three years growth of gas reserves would be available from which propane would be extracted. Mr. Blain, testifying for the applicants, pointed out that the three years growth of gas reserves should in effect be considered as 2 1/2 years since one-half year of the three-year period had already passed.

The applicants estimated that during the 30-year period, 1968 to 1997, 589 million barrels of propane could be made available if all the sources were utilized.

Mr. Blain also presented an estimate of the availability of propane, assuming that gas reserves would continue to grow at

the long term rate of 2.5 trillion cubic feet per year throughout the 30-year period. The daily availability would grow from 42,000 barrels in 1968 to about 213,000 barrels in 1997. Some 1409 million barrels of propane would thus be available from all sources.

The applicants submitted that the latter study was a more realistic estimate of what will likely be the case. They contended that stopping the growth of gas reserves after only 3 additional years was entirely unrealistic. They urged the Board to have regard for more than 3 years growth when considering the propane surplus that may be available for removal from the Province.

The applicants estimated that some 12,900 barrels per day of propane, or 2,100 barrels per day less than the volume applied for, would be available to them in each of the 30 years from the plants they wish included in the proposed permit. About half of the available volume is under contract to the applicants. The remaining half is owned by the applicants or their affiliates.

A more detailed discussion of the applicants' views and those of the Board respecting these matters appear in Appendix A.

#### Demand for Propane

The applicants, through Dr. E. C. Sievwright, a consulting economist, presented a study on the development of Alberta markets for propane, the disposition of Alberta propane production and the Alberta requirements for propane for the period 1968 to 1998.

##### (1) Development of Alberta Propane Markets

Dr. Sievwright referred to the remarkable growth in the market for propane in Alberta since 1956, of which liquid petroleum gas (LPG)

distributors' requirements comprised the largest sector. However, Dr. Sievwright commented that over the past few years the relative importance of this sector had declined.

(2) Disposition of Alberta Propane

Dr. Sievwright noted that between 1956 and 1959 Alberta requirements accounted for some 70 per cent of Alberta total propane production and constituted in excess of 80 per cent between 1960 and 1962. However, since 1962 there has been a steady decline in the share of total production absorbed by Alberta markets to a level of 27 per cent in 1967, reflecting the development of other Canadian and foreign markets.

(3) Forecast of Demand for Propane in Alberta, 1968 to 1998.

In preparing his forecast, Dr. Sievwright identified three sectors of demand: LPG distributors, petrochemical industry and miscible flood. He contrasted the difference between the average annual growth rate of his forecast for total Alberta propane demand of some 3.7 per cent with the higher historical rates which have been obtained since 1956 and attributed this variation to the high degree of saturation already achieved in many rural markets and the increasing severity of competition from natural gas.

Dr. Sievwright projected an average annual rate of growth of some 3.7 per cent for the LPG distributors' market over the forecast period. He anticipated a dampening effect on demand increases from the development of rural natural gas systems, reflecting the inception of plastic pipe installations. The level of LPG

distributors' requirements was anticipated to rise from some 6,000 barrels per day in 1968 to 17,700 barrels per day by 1998.

With respect to petrochemical demand, Dr. Sievwright expected increases at an annual rate of 4.4 per cent over the forecast period, with consumption rising from a level of 3,800 barrels per day in 1968 to 13,500 barrels per day in 1998. Dr. Sievwright said it was not appropriate to make a specific allowance in the forecast for new propane consuming petrochemical plants.

Dr. Sievwright adopted a constant requirement of 1,000 barrels per day per year for miscible flood propane requirements.

In total, Dr. Sievwright estimated that Alberta requirements for propane would rise from some 10,900 barrels per day in 1968 to some 32,200 barrels per day in 1998, resulting in overall requirements for the 30-year period 1969 to 1998 of some 222 million barrels.

Further details of the forecast are given in Appendix B.

#### Permit Commitments

Permit commitments relating to the four subsisting permits - those of Canadian Hydrocarbons Limited, Pacific Petroleum Ltd., The British American Oil Company Limited and Home Oil Company Limited - were tabulated by Dr. Sievwright. The total commitments over the period 1968 to 1995 were estimated to be 122 million barrels, with annual amounts reaching a peak of some 23,700 barrels per day in 1970 and declining to zero by 1988.

Further details of the permit commitments appear in Appendix B.

### Propane Surplus

Comparing the availability forecast presented by Mr. Blain to the requirements estimated by Dr. Sievwright results in a propane surplus which increases from 16,000 barrels per day in 1969 to some 37,000 barrels per day in 1986, then decreases to about 3,000 barrels per day in 1998. The surplus over the 30-year period 1969 to 1998 totals 252 million barrels.

If the rate of gas reserve growth of 2.5 trillion cubic feet per year is continued over the entire forecast period, the propane surplus would increase from 16,000 barrels per day in 1969 to 187,000 barrels per day in 1998. The total surplus during the period would amount to 1,138 million barrels.

When the volumes applied for are related to the first surplus, sufficient propane will be available until 1993. The applicants estimated that the availability of propane would then be some 3,000 barrels per day less than the 15,000 barrels per day applied for. The deficiency would increase to 12,000 barrels per day in 1998. The total shortage would amount to some 13.4 million barrels.

If, however, in the surplus calculation propane resulting from the continuous growth of gas reserves is used the volumes applied for could be met without difficulty over the entire 30-year period.

### Summary

Dome and Pan American argued that the application should be granted since

- (a) the volume of propane that would be removed from the Province pursuant to the proposed permit is surplus to the present and future needs of persons within the Province, and
- (b) its removal would be in the public interest.

III SUBMISSION OF CHEMCELL LIMITED

Chemcell owns and operates a petrochemical plant in Edmonton and currently is the sole consumer in Alberta of propane as a petrochemical feedstock. In its submission, Chemcell estimated propane consumption at its Edmonton plant would amount to some 3,800 barrels per day in 1968 and 1969. It expressed the belief that for years beyond 1969 the previously published estimates of the Board in OGCB Report 65-11<sup>(1)</sup> remain realistic. In addition, Chemcell indicated agreement with the amounts that the Board had allocated to possible new plants in 1970 and 1980. Chemcell emphasized the necessity of ensuring that adequate supplies of propane would be available at reasonable prices in Alberta and requested that the Board continue its existing policies relating to the protection of Alberta's propane requirements.

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(1) Report on the Applications for Permits Authorizing the Removal of Propane from the Province of Canadian Hydrocarbons Limited and The British American Oil Company Limited under The Gas Resources Preservation Act, 1956. September, 1965.

#### IV MATTERS OF SPECIAL CONCERN

There were two matters raised at the hearing that are of special concern to the Board. The first involves the term of the requested permit. The other issue concerns the number of years of growth of gas reserves to be used in the surplus calculation. The applicants' and the Board's views with respect to these matters follows.

##### Permit Period

###### (1) Views of the Applicants

The applicants contended that, in view of the substantial capital investment that they must make, a 30-year permit would be preferable. They agreed, however, that the viability of the scheme is not dependent on a 30-year permit.

###### (2) Views of the Board

All permits so far issued by the Board for the removal of propane or gas from the Province have been for a maximum term of 25 years and this in fact has become Board policy. The Board continues to believe that a 25-year term is appropriate and is not prepared to consider issuance of a permit for a longer period.

##### Growth of Gas Reserves

###### (1) Views of the Applicants

The applicants considered the use of only two years growth of gas reserves in assessing the volume of propane that would be available to be unrealistic. They submitted that reserves would continue to grow for many years and that at least some of the

additional growth should be recognized in calculating the surplus.

(2) Views of the Board

The Board in OGCB Report 68-A<sup>(1)</sup> indicated its willingness to consider at a special public hearing the use of more than two years growth of gas reserves, if an interested party makes such an application. Any decisions on this matter made as a result of such a hearing would be applied to the calculation of a propane surplus. In the meantime, the Board will continue to use the propane associated with two years growth of gas reserves.

In addition to the matters raised by the applicants, the Board in its deliberations with respect to the application has had regard to the following matters:

Surplus

The Board applied the three tests it has used in assessing previous applications to determine whether propane surplus to the 30-year needs of Alberta and the present commitments is available.

The tests involve:

- (a) a comparison of the total propane reserves to the total requirements and commitments,
- (b) a year by year supply-demand balance for the possible 25-year period of the proposed permit, and
- (c) a comparison of the propane reserves remaining at the

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(1) Report on an Application of Trans-Canada Pipe Lines Limited under The Gas Resources Preservation Act, 1956. November 1968.

end of the possible term of the permit applied for to the total requirements for the remainder of the 30-year period of protection.

The results obtained after applying the tests are shown in Appendix D.

Plant Volumes

The potential supply of propane at the plants from which the applicants wish to remove propane must exceed in the aggregate the volumes applied for and the contractual obligations that may exist at the plants.

The applicants' views and Board's assessment of this matter is presented in Appendix D.

V FINDINGS

The Board having heard publicly the application under The Gas Resources Preservation Act, 1956, of Dome Petroleum Limited and Pan American Canada Oil Company, Ltd. and having studied the evidence submitted by the applicants at the public hearing, and having regard to the advice of its staff and to its own knowledge, finds as follows:

1. IN THE MATTER OF THE RECOVERABLE RESERVES AND THE YEAR BY YEAR AVAILABILITY OF PROPANE IN ALBERTA

The Board estimates the total recoverable reserves of propane in Alberta as of May 31, 1968, to be some 597 million barrels, of which some 522 million barrels will be recovered from existing or approved processing plants and some 75 million barrels will be recovered by future facilities if there is sufficient demand for propane. The corresponding estimates prepared in 1966 and presented in OGCB Report 66-D<sup>(1)</sup> are some 441, 386 and 55 million barrels respectively.

The Board estimates the production of propane from existing and Board approved processing plants will be approximately 49,000 barrels per day in 1969, will increase to some 60,000 barrels per day in 1972, and will then decline gradually to about 19,000 barrels per day by 1994. The Board further estimates that if there is sufficient demand for propane, additional recovery will occur at processing plants to be constructed in the future in an amount

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(1) Report on the Application for a Permit Authorizing the Removal from the Province of Propane of Home Oil Company Limited under The Gas Resources Preservation Act, 1956. August 1966.

of about 10,000 barrels per day commencing in 1970, increasing to 15,000 barrels per day in 1974, declining thereafter to 6,000 barrels per day in 1994. Combining these two estimates gives a year by year availability of propane of some 49,000 barrels per day in 1969, increasing to 75,000 barrels per day in 1972, and thereafter declining gradually to about 26,000 barrels per day by 1994.

Details of the evidence and the Board's estimates of reserves and year by year availability of propane are presented in Appendix A.

2. IN THE MATTER OF TRENDS IN EXPLORATION AND  
THE GROWTH OF RECOVERABLE RESERVES AND YEAR  
BY YEAR AVAILABILITY OF PROPANE IN ALBERTA

The Board's latest study of trends in the growth of gas reserves indicates a long term growth of 2.5 trillion cubic feet per year and a growth of 5.8 trillion cubic feet during the 27-month period, March 1, 1966, to May 31, 1968 - equivalent to 2.6 trillion cubic feet per year. The Board is confident that the Province may reasonably count on a two-year growth in gas reserves of 5.0 trillion cubic feet. The Board estimates that in addition to the propane reserves referred to in Finding 1, a recoverable reserve associated with the 5.0 trillion cubic feet of gas of some 76 million barrels may also be counted upon.

The Board expects that propane production from the 5.0 trillion cubic feet will commence in 1972 at a rate of some 1,900 barrels per day and will gradually increase to about 7,600 barrels per day by 1975. This production is in addition to that referred to in

Finding 1.

Details of the evidence and the Board's estimates are presented in Appendix A.

3. IN THE MATTER OF THE PRESENT AND FUTURE REQUIREMENTS OF ALBERTA FOR PROPANE AND THE PRESENT PERMIT COMMITMENTS

The Board estimates the requirements of Alberta for propane for the 30-year period, June 1, 1968, to May 31, 1998, to be some 243 million barrels. The present estimate is some 22 million barrels greater than that presented in OGCB Report 66-D.

The commitments remaining at June 1, 1968, associated with permits issued for the removal of propane from Alberta are estimated to total some 119 million barrels.

Details of the evidence and the Board's estimates of Alberta's requirements and the present permit commitments are presented in Appendix B.

4. IN THE MATTER OF THE MEETING OF THE 1969-1998 REQUIREMENTS OF ALBERTA TOGETHER WITH THE PRESENT PERMIT COMMITMENTS, AND THE RESULTING SURPLUS.

Having regard to the 522 to 597 million barrels of propane estimated to be recoverable from established gas reserves, the 76 million barrels of propane estimated to be recoverable from two years growth of gas reserves, the 30-year requirements of Alberta of 247 million barrels of propane, and the permit commitments of 114 million barrels, the Board finds that there is an overall surplus of 237 to 312 million barrels of propane. The 237 million barrels is based on existing facilities and the 312 million barrels

on existing and future facilities.

The Board estimates that after providing for the annual requirements of Alberta and the permit commitments there will be a propane surplus, based on production from existing facilities, of 13,000 barrels per day in 1969, increasing to some 30,000 barrels per day in 1981, declining gradually to about 1,400 barrels per day by 1992, a deficit of some 200 barrels per day in 1993 and a deficit of 2,000 barrels per day in 1994. If allowance is made for future processing facilities, the surplus during 1969 is unchanged, but increases to some 42,000 barrels per day in 1977, and declines thereafter to about 4,000 barrels per day in 1994. As indicated in its previous propane reports, the Board places greater weight on the latter figures and is satisfied that the deficiencies indicated by restricting the analysis to existing facilities will not materialize.

The Board estimates that the reserves of propane in 1994, at the end of the term of the requested permit, will be of the order of 111 to 119 million barrels. Alberta's requirements for the remainder of the 30-year period, 1994 to 1998, are some 45 million barrels, thus resulting in a surplus above the requirements of the remainder of the forecast period of the order of 66 to 74 million barrels.

Details of the evidence and the Board's analysis of these matters appear in Appendix C.

5. IN THE MATTER OF THE VOLUMES APPLIED FOR

The Board's estimate of the potential propane production at

the plants included in the application is less than that presented by the applicants. The Board believes, therefore, that the volumes applied for should be reduced to those that the Board estimates could be produced. The Board's estimate of the producible volumes and the volumes that could be included in a permit obtained by the application of the rules discussed in Section IV and Appendix D are shown in Table D-1.

The application of the rules results in a permit volume in the last year of the term which the Board estimates is greater than the surplus then existing. The volume to be removed in 1994 should, therefore, be reduced further to a level equal to the surplus in that year. This represents a further reduction of some 1,000 barrels per day.

Details of the Board's analysis relating to these matters are presented in Appendix D.

6. IN THE MATTER OF THE APPLICATION OF DOME PETROLEUM LIMITED AND PAN AMERICAN CANADA OIL COMPANY, LTD. FOR AUTHORIZATION FOR THE REMOVAL OF PROPANE AND THE SURPLUS WHICH WOULD RESULT IF A PERMIT IS GRANTED.

The Board finds that if the application were granted to the extent of a 25-year term for the reduced volumes the overall reserves of propane surplus to the 30-year requirements of the Province and the permit commitments would be some 74 million barrels based on existing facilities and 66 million barrels based on existing and future facilities.

The Board finds that after providing for Alberta's annual requirements, the permit commitments, and the 25 years volumes of

the proposed permit, the year by year surplus of propane, based on production from existing facilities and including a two-year growth of gas reserves, would be 13,000 barrels per day in 1969, increasing to 19,000 barrels per day in 1980, decreasing thereafter to 1,000 barrels per day in 1989. A deficit increasing to 7,000 barrels per day would occur over the years 1990 to 1994. If allowance is made for future processing facilities, the surplus would increase from 13,000 barrels per day in 1969 to some 31,000 barrels per day in 1977, decreasing gradually thereafter to a balanced position in 1994. As in Finding 4 the Board places greater weight on these latter figures and is satisfied that the deficiencies indicated by the former figures would not materialize.

Should the permit for a 25-year term for the reduced volumes be granted, the reserves remaining in 1994 at the end of the term and the surplus over the remaining 30-year requirements of Alberta and the subsisting permit commitments, would be unchanged from the 111 to 119 million barrels of reserves and from the 66 to 74 million barrels of surplus referred to in Finding 4.

The Board concludes that, subject to Finding 5, such a permit could be granted without adversely affecting the protection for Alberta's requirements and the subsisting permit commitments.

Details of the Board's analysis relating to these matters are presented in Appendix D.

7. IN THE MATTER OF THE DISPOSITION OF THE APPLICATION  
OF DOME PETROLEUM LIMITED AND PAN AMERICAN CANADA  
OIL COMPANY, LTD.

In the light of its findings and its responsibility under the Act, the Board is prepared, with the approval of the Lieutenant Governor in Council, to issue a permit to Dome Petroleum Limited and Pan American Canada Oil Company, Ltd. authorizing them to remove from the Province the volumes of propane set out in Appendix D, the permit to be in the form shown in Appendix E and subject to the terms and conditions therein contained.

Respectfully submitted,

G. W. Govier, P. Eng.  
Chairman

A. F. Manyluk, P. Eng.  
Deputy Chairman

Vernon Millard,  
Board Member

Dated at Calgary, Alberta  
this 20th day of November, A.D. 1968.

## APPENDIX A

### THE PRESENT AND FUTURE AVAILABILITY AND THE RESERVES OF PROPANE IN THE PROVINCE OF ALBERTA

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#### Introduction

The Board in OGCB Report 66-D<sup>(1)</sup> included an estimate of the recoverable reserves of propane in the Province, a forecast of the propane available from established reserves by years for the period 1966 to 1987 inclusive, and a forecast of propane availability associated with two years growth of gas reserves. Since the completion of that report, additional evidence concerning propane production has become available. The evidence includes applications made to the Board to alter existing or to construct new processing facilities, additional gas analyses for various fields, pools, or processing plants, and applications of Trans-Canada Pipe Lines Limited and Alberta and Southern Gas Co. Ltd. for authorization for the removal of additional quantities of gas from the Province. As a result of the new evidence and the time that has elapsed since its last comprehensive look at these matters, the Board has made a complete new study of the propane availability and reserves.

As in the case of its earlier reports, the Board has concerned itself with the reserves and availability of field propane only and has excluded propane produced in refineries and in self-sustaining miscible flood projects. For example, propane for the miscible

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(1) Report on the Application for a Permit Authorizing the Removal of Propane from the Province of Home Oil Company Limited under The Gas Resources Preservation Act, 1956. August 1966.

flood schemes expected in the Rainbow-Zama area will be produced from gas available in the area. Therefore, neither the amount of propane needed or its availability are included in this report.

With respect to the period covered by the forecast, since one of the tests which the Board applies in assessing the surplus involves a year by year supply-demand balance for the longer of the period of the requested permit or the longest existing permit to remove propane from the Province, and since the Board does not propose to grant a permit for a term longer than 25 years, the forecast has been completed for the period 1969 to 1994 inclusive.

#### Future Availability of Propane

##### (1) Views of the Applicants

The applicants' forecast of the year by year availability of propane was prepared in a manner that differs with those presented to the Board in the past by others and the method the Board itself uses.

The applicants estimated the quantity of marketable gas that must be produced in each year of the 30-year period, 1968 to 1997, to fulfil existing gas permit commitments. The volumes were then added to the Board's estimates of the gas requirements of Alberta presented in its OGCB Report 66-C<sup>(2)</sup>. To this was added an allowance for growth in the volumes of gas now authorized for removal from

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(2) Report on an Application of Trans-Canada Pipe Lines Limited under The Gas Resources Preservation Act, 1956. June 1966.

the Province. The allowance amounted to 224 billion cubic feet from 1968 to 1969, a further 110 billion cubic feet from 1969 to 1970, and thereafter the increase was assumed to be at a rate of 25 billion cubic feet per year. In this manner the applicants estimated that some 40.6 trillion cubic feet of marketable gas would be produced during the 30-year period. They did not attempt to determine if the volumes of marketable gas needed could in fact be produced from the reserves of gas now established and from three years growth of reserves.

The propane content of the produced gas was determined using performance data from existing plants. The recoverable propane was estimated at 14.5 barrels per million cubic feet of gas produced. The applicants considered that the ratio of 14.5 barrels per million was appropriate for the entire forecast period. They recognized that "some of the plants would lean out as a result of termination of cycling operations, however, there would be sufficient new rich gas reserves found and deep cut facilities added to older plants to maintain at least a minimum provincial average propane recovery ratio of 14.5 barrels per million cubic feet of marketable gas".

Included in the forecast of reserves of gas available to meet the gas requirements estimated by the applicants was an allowance of 7.5 trillion cubic feet. This is equivalent to three years growth at the long term rate of 2.5 trillion cubic feet per year.

Based on all of the foregoing assumptions, the applicants

estimated that the availability of propane would increase from 42,000 barrels per day in 1968 to 63,000 barrels per day in 1986, decreasing thereafter to 37,000 barrels per day by 1997.

The applicants presented a second forecast assuming that the growth of gas reserves would continue over the entire 30 years at the historic rate of 2.5 trillion cubic feet per year, and that the production of gas would grow at the rate experienced during the preceding three years. In this manner they estimated the potential propane production would increase from 42,000 barrels per day to 213,000 barrels per day in 1997.

#### (2) Views of the Board

The Board has prepared a new forecast of propane availability from established gas reserves with respect to both the propane expected to be recovered from processing facilities in existence or approved by the Board and the additional quantities that could result from future processing facilities.

Table A-1 presents the Board's forecast of the propane available from established gas reserves for the period 1969 to 1994 from existing propane recovery facilities and those which are not yet in operation but which have been approved by the Board up to November 1, 1968. The table includes the expected availability from field facilities and from plants reprocessing pipe line gas. The propane available from the reprocessing of pipe line gas was estimated in the light of the existing or approved field facilities for the recovery of propane.

Table A-2 presents the Board's forecast of additional propane

expected from future processing facilities. The table shows estimates for those fields where propane is not now being recovered but where the Board expects propane production might occur under more favourable marketing conditions.

For the purpose only of this forecast the Board has assumed that two additional gas cycling schemes may be instituted in the Kaybob South Field. The rate of cycling and the daily and annual volumes of propane that would be available were assumed having regard to the plant now under construction in the northern part of the field and to operators' future plans for the remainder of the field.

The inclusion of volumes of propane from these assumed future cycling plants in this forecast should not be taken as an indication that the cycling schemes planned will necessarily receive Board approval. Such approval will depend upon the Board's appraisal of specific applications under the provisions of The Oil and Gas Conservation Act, and the Board's proration policy. Inclusion of the volumes in this way results in a conservative analysis in so far as protection for the Province is concerned since it provides for the production of the propane reserves of a field in the early years of the forecast at times of abundant surplus rather than in the later years when the estimated surplus is less.

If the additional facilities reflected in the second portion of the table are installed, a result will be a reduction in propane recovery from pipe line reprocessing plants. For this

reason, the third portion of the table has been prepared to reflect the reduction in propane available from reprocessing plants that would result with the installation of the additional field facilities.

The final portion of the table shows the total propane expected to be available in the Province. (Table A-1 plus Table A-2). The total reflects the gas production expected from established reserves only. The gas production will be sufficient to meet all of the existing commitments for the removal of gas from the Province and the major portion of the future Provincial 30-year gas requirements. The remainder of the Provincial requirements will be satisfied from the expected growth of gas reserves. The propane availability associated with this gas will be discussed later in the appendix.

The following is a summary of the manner in which the forecasts in Tables A-1 and A-2 have been prepared:

1. The gas producing rates for each field or area were taken from the latest deliverability schedules available to the Board. Where the gas was being delivered to an extraprovincial market, production was considered for only the term of the applicable permit. Where schedules were not available or were outdated, the rate of gas production used was about one million cubic feet per day for each 8.5 billion cubic feet of reserves. In areas where the plant feed will be oil field separator gas, the producing rate was forecast on the basis of the expected oil allowables and gas-oil ratio behaviour for the pools involved.

Where fields were not yet producing gas, the date of initial production was estimated having regard for the future Provincial requirements for gas and for the Board's knowledge of plans for pipe line construction in the Province.

2. The composition of gas produced from each pool was based on a representative analysis.

3. Changes in the composition of the gas being produced from any particular pool were based on reservoir fluid studies wherever possible. In areas where retrograde effects were anticipated but fluid studies not available, changes in propane content were estimated by comparison to similar reservoirs for which studies were available. Where gas cycling schemes to curtail retrograde losses were in operation or expected in the future, the production forecast reflects the Board's estimate of how the propane recovery will be affected by continued cycling.

4. Plant recovery efficiencies were based on plant history wherever fields had been producing for a reasonable length of time. In those areas where plants were in the planning or construction stage or had been operating for only a short time, recoveries were based on submissions presented to the Board in support of applications under section 38 of The Oil and Gas Conservation Act, or on the Board's general knowledge. For the areas listed in Table A-2 where the Board had no information regarding the proposed plant design the recovery efficiencies were estimated having regard to expected economic conditions, the quantity and

composition of the gas to be produced, the heating value and dew point standards for the marketable gas. In general, the availability expected from plants to be built in the future reflects recoveries of some 70 per cent of the propane contained in the raw gas stream.

5. The gas throughput and composition for plants reprocessing pipe line gas were based on the predicted amount and composition of the residue gas available from the fields or areas supplying or expected to supply such plants. The propane recovery ratios were based on plant design.

The Board's forecast of the propane available from established reserves and existing or approved facilities as presented in Table A-1 shows an increase from a 1969 rate of some 49,000 barrels per day to a peak of about 60,000 barrels per day in 1972. The production is then expected to decline slowly to about 19,000 barrels per day by the year 1994, the end of the forecast period. The expected increase over the next four years results both from new processing facilities expected to be on stream and from additional quantities of gas being processed at many of the existing plants. The decline in the later years is the result of a general decline in raw gas producing rates resulting from the gradual depletion of the pools currently producing.

Table A-2 shows that if market conditions are attractive an additional 10,000 barrels per day of propane will be available beginning in 1970. The additional availability is expected to increase to about 15,000 barrels per day in 1974, declining

gradually thereafter to some 6,000 barrels per day in 1994. The additional propane may be recovered by field plants or by central facilities for the reprocessing of pipe line gas. The table shows that some additional propane may be expected from the reprocessing of gas from future plant facilities in plants on trunk lines. The table also shows that the total propane available from established reserves will increase from a 1969 production rate of some 49,000 barrels per day to some 75,000 barrels per day in 1972, and thereafter will decline steadily to about 26,000 barrels per day in 1994.

The new forecast represents an increase since the Board's last published estimate, OGCB Report 66-D, varying from some 11,000 to 26,000 barrels per day during the forecast period. The major changes in the projected propane availability at individual processing plants since the Board's last estimate results from:

1. Propane recovery facilities have been approved by the Board in the Equity, Jumping Pound, Kaybob South, St. Albert-Big Lake and Sylvan Lake Fields. This results in an increase in the forecast propane production from existing facilities of some 6,000 barrels per day.
2. The approval of a plant for the reprocessing of pipe line gas at Cochrane increased the availability of propane from approved facilities by some 7,000 to 9,000 barrels per day.
3. Increased gas producing rates from the Carstairs and Waterton Fields resulted in an additional 3,000 barrels per day.
4. Higher oil producing rates in the Judy Creek complex and

the Pembina and Redwater Fields increased the availability of propane by about 1200 barrels per day.

5. Gas from the Lookout Butte Field now being processed in the Pincher Creek plant increased the propane availability by some 500 barrels per day.

6. The propane available from future plant facilities is some 4,000 to 8,000 barrels per day greater than in the previous estimate. The increase is due to a growth in the reserves of gas in certain of the fields and an anticipation that additional facilities will be installed in more fields than previously estimated.

Dome and Pan American proposed the removal from the Province of propane produced at the Cochrane, Edmonton Liquid Gas, Fox Creek, Provost, Pembina (Goliad), Vulcan, Gilby (Texaco), Lobstick Easyford, Carson Creek and Carstairs processing plants. At the hearing the applicants presented a forecast of availability at each plant for the period 1968 to 2000 inclusive. Their forecast indicates that the amount of propane available to them from the processing plants will be some 12,900 barrels per day throughout the forecast period.

The Board presents as part of Tables A-1 and A-2 its own estimate of the propane production expected from the various processing plants referred to by the applicants. The through puts of gas upon which the forecast is dependent were based on the most recent delivery schedule available from Trans-Canada Pipe Lines Limited and Alberta and Southern Gas Co. Ltd., the purchasers of

most of the residue gas from the processing plants, and on the Board's own estimate of gas reserves and delivery characteristics of the pools supplying the plants. The Board's forecast of propane production from the plants from which the applicants propose to take propane is somewhat less than that estimated by the applicants. The Board estimates that some 2,600 barrels per day will be available to the applicants in 1969 increasing to about 12,000 barrels per day in 1982, decreasing thereafter to about 5,400 barrels per day in 1994. The Board's forecast for the latter part of the period is considerably less than the applicants' because the Board expects the production of gas from the pools supplying the plants to decline normally, whereas the applicants' estimates reflect production which would, in some cases, total in excess of the reserves estimated by the Board and the applicants themselves. For these reasons the Board does not accept the applicants' estimates and will rely upon its own availability forecast.

Production of Propane from Gas Reserves Not Yet Discovered

(1) Views of the Applicant

The applicants did not present a separate tabulation of the volumes of propane expected from the growth of gas reserves. They assumed that the present reserves of gas would grow during the next three years at the long term rate of 2.5 trillion cubic feet per year, and that the recoverable propane content of the new gas would be 17.8 barrels per million cubic feet of gas. The additional

reserves would be available to meet the gas requirements estimated by the applicants. In a second forecast, as discussed previously, the applicants assumed that the reserves of gas would continue to grow at the rate of 2.5 trillion cubic feet per year over the entire forecast period. The new reserves along with the reserves now established would be available to meet the expanded gas requirements.

(2) Views of the Board

As discussed in Section IV, the Board intends to continue its policy of using the propane available from two years growth of gas reserves when determining the volumes that may be available for removal from the Province. The Board's estimate of the propane available from this source involves

- (a) a projection of the growth rate for gas reserves,
- (b) a projection of the annual pattern by which these reserves will be produced, and
- (c) an estimate of the recoveries of propane from the future gas.

The Board's OGCB Report 68-18<sup>(3)</sup> includes a detailed analysis of the trends in the growth and discovery of gas reserves as of December 31, 1967. The report shows that the long-term growth rate for gas reserves has remained unchanged at some 2.5 trillion cubic feet per year. The actual reserve growth over the two-year period May 31, 1966 to May 31, 1968, was at the rate of some 2.6

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(3) Reserves of Crude Oil, Gas, Natural Gas Liquids and Sulphur, Province of Alberta. December 31, 1967.

trillion cubic feet per year. Therefore, in keeping with its policy of using the lesser of the actual growth in reserves over the two previous years or two years of growth at the long-term growth rate, the Board has decided to rely on the propane expected from 5.0 trillion cubic feet of gas reserves not yet developed in satisfying Alberta's long-term requirements for propane.

The new gas reserves will be produced to supply Alberta's long term requirements and extraprovincial markets. The Board expects that the production pattern of the past few years will continue with a portion of the new reserves being tied into markets beginning in 1972. While both the volumes and the time at which the reserves will be produced are uncertain, the Board believes that the estimates shown in Table A-3 are realistic and appropriate for the purpose of estimating the future propane availability. The recoverable propane content of the additional reserves has been assumed to be equivalent to that of reserves of gas now established, or some 15 barrels per million cubic feet of gas.

The Board estimates that the new reserves will commence producing gas in 1972 at about 125 million cubic feet per day and will increase to 500 million cubic feet by 1975, remaining at that level during the rest of the forecast period. The rate of gas production was based on the historic rate of one million cubic feet per day for each 10 billion cubic feet of marketable reserves, and will start in the fourth year after discovery. This time lag is intended to reflect the time necessary to develop the reserves,

to build processing and pipe line facilities, to develop additional markets, and to obtain the necessary Board and Government approvals. The expected gas production from reserves not yet developed is shown in column 2 of Table A-3, while the availability of propane from the projected gas production is shown in columns 3 and 4. The table shows that propane production from reserves not yet developed will begin in 1972 at some 1,900 barrels per day increasing to some 7,600 barrels per day by 1975, and remaining at that level until 1994.

Table A-4 presents the total future propane availability as estimated by the Board. The estimates have been taken from Tables A-1, A-2 and A-3, and the totals have been rounded to the nearest 100 barrels per day. The table shows that the total future potential availability of propane in Alberta will increase from a 1969 rate of some 49,000 barrels per day to a peak of some 79,000 barrels per day in 1975. The production will then decline to some 33,000 barrels per day by 1994, the final year of the forecast period.

A significant comparison of the Board's forecast with that presented by the applicants is difficult. The applicants availability is based on reserves of gas at December 31, 1966, and on the performance of existing processing facilities at the beginning of 1968. The Board's estimates rely on plants existing or approved to November 1, 1968, and on reserves of gas to May 31, 1968.

#### Reserves of Propane

##### (1) Views of the Applicant

Mr. Blain presented a detailed estimate of the reserves of

propane in the Province. He estimated the total reserves as of December 31, 1966, to be some 470.6 million barrels consisting of 381.3 million barrels from gas reserves being processed in existing facilities and 89.3 million barrels from established gas that will be processed in new plants or in new facilities expected to be added to existing plants.

The estimates were obtained assuming that 60 per cent of the propane contained in the gas delivered to the gas processing plants will be recovered as commercial propane. Mr. Blain's estimates do not include reserves in the Kaybob South - Clarke Lake area or the Quirk Creek area because data from both newly discovered areas were not available to him.

Mr. Blain considered that an additional 133.5 million barrels of propane will be available from three years growth of gas reserves. The long term growth rate of 2.5 trillion cubic feet of gas per year and a recoverable propane content of 17.8 barrels per million cubic feet of gas, the content of some of the most recent, rich gas discoveries, such as Kaybob South, were used in his estimates.

The overall reserve of propane available to meet Alberta's long term requirements and the present permit commitments was, therefore, considered by Mr. Blain to be 604.1 million barrels.

## (2) Views of the Board

The Board has updated its estimate of the established propane reserves in the Province to reflect data to May 31, 1968, and its estimate of the propane associated with two years growth

of gas reserves. Table A-5 presents the established recoverable reserves of propane as estimated by the Board. Part A of the table tabulates those fields and plants where propane is now being recovered or where recovery facilities have been approved. Part B lists those fields, areas, or plants, where, in the Board's opinion, propane will be recoverable economically in the future. The table has been prepared by applying the recovery ratio for each pool or each plant to the remaining gas reserves for the pool. Columns 1, 2 and 3 of the table show the gas processing plant name and operator, the fields or areas being served by the plant, and the producing pools. Column 4 is the total remaining marketable gas reserve as of May 31, 1968, for the pools designated in column 3. The reserves have been taken from Table A-1 of the Board's OGCB Report 68-A<sup>(4)</sup>. Column 5 is a tabulation of the average propane recovery factor over the life of each pool as determined from Table A-1 and A-2. Column 6 is the product of columns 4 and 5 and is the recoverable propane reserve for each field, area or plant.

In addition to the reserves recoverable from field processing plants, the table shows propane reserves that could result from the reprocessing of pipe line gas. Since the estimates of the reserves of propane recoverable from the reprocessing of pipe line gas have been based on the residue gas available from existing field facilities, the installation of the future facilities

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(4) Report on an Application of Trans-Canada Pipe Lines Limited under The Gas Resources Preservation Act, 1956. November 1968.

reflected in the second portion of the table would result in a reduction in the reserves available from the straddle plants. Part C of the table has, therefore, been included to adjust downward the reserves available from the reprocessing of pipe line gas and to make them consistent with the additional reserves shown for field recovery facilities.

Table A-5 shows that the recoverable propane reserves based on existing or approved processing facilities are estimated by the Board as of May 31, 1968, at some 522 million barrels. The table also shows that if sufficient demand for the product should materialize, an additional 75 million barrels of propane can be considered as recoverable, increasing the total established reserves to some 597 million barrels.

As mentioned previously the Board estimates the recoverable propane content of the 5.0 trillion cubic feet of gas reserves not yet developed (two years growth) to be some 15 barrels per million cubic feet. The result is a propane reserve from future gas of some 76 million barrels, increasing the total reserves to about 673 million barrels.

This represents an increase in the propane reserves since the Board's last published estimate in OGCB Report 66-D, of some 136 million barrels from existing facilities, 20 million barrels from future facilities, and some 16 million barrels from two years growth of gas reserves, or a total increase of 172 million barrels. The major changes since the Board's last estimate are due to

- (a) installation of deeper-cut propane recovery facilities at the Harmattan area plant, Judy Creek plant, and the Waterton plant.

- (b) new facilities for the recovery of propane installed in the Jumping Pound plant, Kaybob South plant, and the Pembina (Cities Service) plant,
- (c) additional gas liquids from the Judy Creek plant available for fractionation in the Leduc-Woodbend plant and in the Edmonton Liquid Gas Plant,
- (d) improved recoveries at existing facilities in the Pembina Field,
- (e) Lookout Butte Field production being processed in the Pincher Creek plant,
- (f) more gas of higher propane content flowing through the Foothills Division of The Alberta Gas Trunk Line Company Limited system,
- (g) discovery of high propane content gas in Quirk Creek and Kaybob South Fields, and
- (h) generally to more and better data now available.

It is difficult to make a meaningful comparison of the reserves of propane as estimated by the applicants with those of the Board. The applicants' estimate from existing and future facilities and two years growth of gas reserves is some 160 million barrels less than the Board's. A substantial portion of the difference results from the additional growth in reserves that has occurred between December 31, 1966, the date of the applicants' estimate, and May 31, 1968, the date used by the Board. New facilities installed since December 31, 1966, and improved recoveries experienced in existing plants also contribute to the difference.

TABLE A-1

PROPANE AVAILABILITY FROM ESTABLISHED GAS RESERVES  
(1)  
BASED ON EXISTING PLANT FACILITIES (BARRELS PER DAY)

that has occurred between December 31, 1966, the date of the applicants' estimate, and May 31, 1968, the date used by the Board. New facilities installed since December 31, 1966, and improved recoveries experienced in existing plants also contribute to the difference.

<u>PLANT</u>	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
WAYNE-ROSEDALE (REDLAND)	50	50	60	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
WILLESDEN GREEN	140	130	130	130	130	130	130	130	120	120	120	120	120	120	120	120	120	120	120	120	110	110	110	110	110	110
WORSLEY	250	220	190	180	180	170	160	150	150	140	130	130	130	100	80	60	40	20								
EDMONTON LIQUID GAS	1840	1960	2030	2100	2070	2030	2010	2000	1990	1970	1960	1930	1910	1890	1850	1840	1800	1780	1750	1710	1680	1650	1620	1580	1540	1410
EMPRESS	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000	11700	10300	9540	8320	6960	5960	5060	4090	3430	2900	2460	2060	
COCHRANE	5400	6710	6710	6710	6760	6740	6730	6690	6650	6600	7090	8230	8750	8750	8750	8750	8750	5400	5400	3410	3410	3410	3410	3410	3410	
TOTAL	48740	55610	58790	59850	59910	58000	57470	57100	56480	56170	56830	57710	57510	54200	47840	41020	32210	36890	30850	26800	27270	23710	22410	21490	20490	16270

FOOTNOTES:

- (1) INCLUDE FACILITIES APPROVED BY THE BOARD UP TO OCTOBER 1, 1968.
- (2) PROCESSES GAS PRODUCED IN BONNIE GLEN, GLEN PARK, AND WIZARD LAKE FIELDS.
- (3) PROCESSES GAS PRODUCED IN CARSON CREEK AND CARSON CREEK NORTH FIELDS.
- (4) PROCESSES GAS PRODUCED IN THE CARSTAIRS FIELD AND THE CROSSFIELD RUNDLE A POOL.
- (5) PROCESSES GAS PRODUCED IN THE EQUITY FIELD AND A PORTION OF THE GHOST PINE FIELD.
- (6) PROCESSES GAS PRODUCED IN THE HARMATTAN-ELKTON AND HARMATTAN EAST FIELDS.
- (7) TENNECO OILS & MINERALS LTD. PLANT.
- (8) PROCESSES GAS PRODUCED IN THE JUDY CREEK, SWAN HILLS, SWAN HILLS SOUTH, AND VIRGINIA HILLS FIELDS, BUT DOES NOT INCLUDE THAT PORTION OF THE PRODUCTION OWNED BY PAN AMERICAN PETROLEUM CORPORATION.
- (9) PROCESSES GAS PRODUCED IN THE JUMPING POUND, JUMPING POUND WEST, AND SARCEE FIELDS.
- (10) PROCESSES GAS PRODUCED FROM THE BEAVERHILL LAKE POOL AND THE TRIASSIC POOL.
- (11) PROCESSES GAS PRODUCED FROM THE VIKING AND CADOMIN POOLS.
- (12) PROCESSES GAS PRODUCED FROM THE ALIX, CLIVE, ERSKINE, FENN-BIG VALLEY, FENN WEST, HACKETT, RICH, STETTLER, STETTLER SOUTH FIELDS, AND A PORTION OF THE GAS PRODUCED IN THE NEVIS FIELD.
- (13) PROPANE IS PRODUCED AT THREE PLANTS - GOLIAD PLANT, TEXACO PLANT, AND CITIES-SERVICE KEYSTONE PLANT.
- (14) PROCESSES GAS PRODUCED IN THE PINCHER CREEK AND LOOKOUT BUTTE FIELDS.
- (15) PROCESSES GAS PRODUCED IN THE HOMEGLEN-RIMBEY, WESTEROSE, AND WESTEROSE SOUTH FIELDS.
- (16) PROCESSES GAS PRODUCED IN THE ATIM, CAMPBELL-NAMAO, EXCELSIOR, MORINVILLE, ST. ALBERT-BIG LAKE AND WESTLOCK FIELDS.
- (17) PROPANE PRODUCED AT TWO PLANTS - HUDSON'S BAY PLANT AND CHEVRON PLANT.

that has occurred between December 31, 1966, the date of the applicants' estimate, and May 31, 1968, the date used by the Board. New facilities installed since December 31, 1966, and improved recoveries experienced in existing plants also contribute to the difference.

TABLE A-2

 PROPANE AVAILABILITY FROM ESTABLISHED GAS RESERVES  
 AND FUTURE PLANT FACILITIES (BARRELS PER DAY)

PLANT	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
BIGSTONE		720	720	720	700	700	720	720	740	760	820	820	820	820	760	640	550	470	410	360	290	220	160	90	60		
FERRIER	1730	1790	1910	1910	1910	1920	1920	1920	1830	1730	1730	1730	1660	1230	740	410	250	170									
GHOST PINE (1)	1150	1190	1270	1270	1270	1270	1270	1070	890	650	370	120															
GILBY	630	650	700	700	700	700	700	700	790	790	740	690	630	540	470	380	340	300	170	50							
GOLD CREEK	780	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900		
KAYBOB (2)		1270	1280	1280	1280	1280	1300	1320	1200	880	700	580	500	450	410	360	320	280	250	210	70	60	50	40			
KAYBOB SOUTH (3)	3000	3000	3000	3000	3000	2700	2400	2000	1600	1000	570	570	570	570	570	570	570	570	570	570	570	570	570	570	570	570	
KAYBOB SOUTH	8800	8800	8800	8800	8800	8000	7000	6000	5000	4000	3000	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	
MINNEHIK-BUCK LAKE	550	640	640	640	640	640	640	640	660	680	700	690	610	510	450	410	360	330	300	270	70	70	70	50			
MITSUE		590	620	640	660	670	710	720	740	770	790	790	810	840	850	870	890	900	920	940	950	970	990	1000	1000		
NIPISI (4)	450	470	490	520	540	560	580	610	630	650	670	700	720	740	760	790	810	830	850	880	900	920	940	940			
PEMBINA (5)	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	320	300	270	160			
PROVOST	430	450	480	480	480	480	480	480	480	480	480	480	480	390	280	150	80	50									
QUIRK CREEK	770	770	770	770	770	770	770	770	770	770	770	770	770	770	770	770	770	770	650	540	380	230	120				
SIMONETTE	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200		
STURGEON LAKE SOUTH	310	310	310	320	320	330	340	350	360	370	370	380	380	380	380	380	370	370	370	360	360	340	340	330	320		
VULCAN	100	110	110	110	110	110	110	110	120	120	130	130	130	120	120	100	80	60	50	30							
WIMBORNE		440	450	480	480	480	480	480	480	480	480	480	480	480	480	480	430	320	170								
REPROCESSING OF GAS FROM FUTURE PLANT FACILITIES	250	520	550	560	580	600	620	650	660	690	710	1090	1100	1130	1140	1150	1170	1190	1200	1210	1230	1230	1250	1260	1250		
Sub-Total	16040	23140	23520	23610	23660	22930	21760	20350	18790	16870	14900	13130	12690	11990	11170	10470	9990	9550	8950	8660	8130	7860	7680	7470	6500		
Less: DECREASED AVAILABILITY FROM COCHRANE AND EMPRESS PLANTS	5710	8500	8800	8830	8810	8820	8860	8680	8420	7810	7380	6520	6460	5680	4820	4070	3530	3040	2430	2180	1700	1570	1480	1350	220		
Total	10330	14640	14720	14780	14850	14110	12900	11670	10370	9060	7520	6610	6230	6310	6350	6400	6460	6510	6560	6480	6430	6290	6200	6120	628		

that has occurred between December 31, 1966, the date of the applicants' estimate, and May 31, 1968, the date used by the Board. New facilities installed since December 31, 1966, and improved recoveries experienced in existing plants also contribute to the difference.

<u>PLANT</u>	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
TOTAL PROPANE AVAILABILITY (TABLE A-1 PLUS TABLE TABLE A-2)	48740	65940	73430	74570	74190	72850	71580	70000	68150	66540	65890	64930	64120	60430	54150	47370	45610	48350	87360	35360	33750	30140	28760	27690	26610	25550

## FOOTNOTES:

- (1) TEXACO PLANT ONLY.
- (2) GAS FROM BEAVERHILL LAKE POOL THAT WILL BE PROCESSED IN SECOND HUDSON'S BAY PLANT.
- (3) SOUTH END OF FIELD OPERATED BY CHEVRON STANDARD.
- (4) PAN AMERICAN LOBSTICK EASYFORD PLANT.
- (5) THAT PORTION OF FIELD BEING PROCESSED BY PROVO GAS PRODUCERS PLANT.

that has occurred between December 31, 1966, the date of the applicants' estimate, and May 31, 1968, the date used by the Board. New facilities installed since December 31, 1966, and improved recoveries experienced in existing plants also contribute to the difference.

TABLE A-3

## PROPANE AVAILABILITY FROM TWO YEARS GROWTH OF GAS RESERVES

YEAR	GAS PRODUCTION (Bcf)	PROPANE AVAILABILITY	
		ANNUAL (THOUSANDS OF BARRELS)	DAILY (BARRELS/DAY)
1972	46	700	1920
1973	92	1400	3840
1974	138	2100	5750
1975	182	2760	7560
1976	182	2760	7560
1977	182	2760	7560
1978	182	2760	7560
1979	182	2760	7560
1980	182	2760	7560
1981	182	2760	7560
1982	182	2760	7560
1983	182	2760	7560
1984	182	2760	7560
1985	182	2760	7560
1986	182	2760	7560
1987	182	2760	7560
1988	182	2760	7560
1989	182	2760	7560
1990	182	2760	7560
1991	182	2760	7560
1992	182	2760	7560
1993	182	2760	7560
1994	182	2760	7560

TABLE A-4

## TOTAL PROPANE AVAILABILITY

(BARRELS PER DAY)

YEAR	FROM EXISTING FACILITIES	FROM FUTURE FACILITIES	FROM TWO YEARS GROWTH	TOTAL
1969	48,700			48,700
1970	55,600	10,300		65,900
1971	58,800	14,600		73,400
1972	59,900	14,700	1,900	76,500
1973	59,400	14,800	3,800	78,000
1974	58,000	14,900	5,800	78,700
1975	57,500	14,100	7,600	79,200
1976	57,100	12,900	7,600	77,600
1977	56,500	11,700	7,600	75,800
1978	56,200	10,400	7,600	74,200
1979	56,800	9,100	7,600	73,500
1980	57,400	7,500	7,600	72,500
1981	57,500	6,600	7,600	71,700
1982	54,200	6,200	7,600	68,000
1983	47,800	6,300	7,600	61,700
1984	41,000	6,400	7,600	55,000
1985	39,200	6,400	7,600	53,200
1986	36,900	6,500	7,600	51,000
1987	30,900	6,500	7,600	45,000
1988	28,800	6,600	7,600	43,000
1989	27,300	6,500	7,600	41,400
1990	23,700	6,400	7,600	37,700
1991	22,500	6,300	7,600	36,400
1992	21,500	6,200	7,600	35,300
1993	20,500	6,100	7,600	34,200
1994	19,300	6,300	7,600	33,200

TABLE A-5

RECOVERABLE RESERVES OF PROPANE AS OF MAY 31, 1968

PLANT (CAN. NATURAL GAS LIQUIDS)	FIELD OR AREA ACHESON	ZONE LEDUC & BLAIRMORE	REMAINING MARKETABLE RESERVES OF NATURAL GAS (Bcf)	PROPANE RECOVERY RATIOS BBL/MMCF OF MARKETABLE GAS	RECOVERABLE PROPANE (MILLIONS OF BARRELS)
A. FROM EXISTING OR APPROVED PLANT FACILITIES					
BONNIE GLEN (TEXACO)	BONNIE GLEN GLEN PARK WIZARD LAKE	LEDUC SOLUTION LEDUC LEDUC	230 8 89	) 39	) 12.8
CARSON CREEK (MOBIL OIL)	CARSON CREEK NORTH	BEAVERHILL LAKE BEAVERHILL LAKE	237 159	) 27	) 10.7
CARSTAIRS (HOME)	CARSTAIRS CROSSFIELD	MISSISSIPPIAN CROSSFIELD MISSISSIPPIAN	642 851	) 13	) 19.4
CROSSFIELD (PETROGAS)	CROSSFIELD	CALGARY MISSISSIPPIAN & BLAIRMORE	532		5.9
EQUITY (MOBIL OIL)	EQUITY & THREE HILLS CREEK	BLAIRMORE & MISSISSIPPIAN	166	*	7
HARMATTAN-ELKTION (CANADIAN SUPERIOR)	HARMATTAN-ELKTION HARMATTAN EAST	MISSISSIPPIAN MISSISSIPPIAN	971 971	-	21 23 <u>22.3</u> <u>42.7</u>
HUSSAR (TENNECO)	HUSSAR	VIKING, COLORADO & BLAIRMORE	357		3.9
JUDY CREEK	JUDY CREEK SWAN HILLS SWAN HILLS SOUTH* VIRGINIA HILLS	BEAVERHILL LAKE BEAVERHILL LAKE BEAVERHILL LAKE BEAVERHILL LAKE	250 302 45 49	) 83	) 53.6

\* EXCLUDING PORTION OWNED BY PAN AMERICAN PETROLEUM CORP.

TABLE A-5 (CONTINUED)

(1)	(2)	(3)	(4)	(5)	(6)
PLANT	FIELD OR AREA	ZONE	REMAINING MARKETABLE RESERVES OF NATURAL GAS (Bcf)	PROPANE RECOVERY RATIOS BBL/MCF OF MARKETABLE GAS	RECOVERABLE PROPANE (MILLIONS OF BARRELS)
JUMPING POUND (SHELL CANADA)	JUMPING POUND JUMPING POUND WEST SARCEE	MISSISSIPPAN MISSISSIPPAN MISSISSIPPAN	299 695 110	7 7 7	7.7 7 7
KAYBOB SOUTH (HUDSON'S BAY)	KAYBOB SOUTH	BEAVERHILL LAKE	350	27	9.5
KAYBOB SOUTH (HUDSON'S BAY)	KAYBOB SOUTH FOX CREEK	VIKING & CADOMIN	188	21	3.9
LEDUC-WOODBEND (IMPERIAL OIL)	LEDUC-WOODBEND	NISKU & LEDUC	384	22	-
NEVIS (BRITISH AMERICAN)	NEVIS FENN-BIG VALLEY & STETTLER	DEVONIAN* NISKU & LEDUC	324	-	-
	HACKETT	BLAIRMORE	11	-	-
	ERSKINE	BLAIRMORE & LEDUC	43	-	-
	RICH	BLAIRMORE	36	-	-
	FENN WEST	VIKING & DETRITAL	11	-	-
	CLIVE-ALIX	NISKU & LEDUC	7	-	-
	OLDS	WABAMUN	62	-	-
	OLDS (AMERADA)	WABAMUN	258	17	4.4
(1)	PEMBINA	BELLY RIVER & CARDIUM	774	53	41.0
(GOLIAD, TEXACO, CANADA-CITIES SERVICE)					
PINCHER CREEK (BRITISH AMERICAN)	PINCHER CREEK LOOKOUT BUTTE	MISSISSIPPAN MISSISSIPPAN	299 441	7 11	2.1 4.9 7.0
REDWATER (IMPERIAL OIL)	REDWATER	LEDUC	37	140	5.2
RIMBEY (BRITISH AMERICAN)	HOME GLEN-RIMBEY WESTEROSE WESTEROSE SOUTH	LEDUC LEDUC LEDUC	557 172 879	26 25 28	14.5 4.3 24.6 43.4

\* PORTION OF POOL PROCESSED BY BRITISH AMERICAN  
(1) THREE PLANTS.

TABLE A-5 (CONTINUED)

(1)	(2)	(3)	(4)	(5)	(6)
PLANT	FIELD OR AREA	ZONE	REMAINING MARKETABLE RESERVES OF NATURAL GAS (BCF)	PROPANE RECOVERY RATIOS BBL/MMCF OF MARKETABLE GAS	RECOVERABLE PROPANE (MILLIONS OF BARRELS)
ST. ALBERT (CIGOL)	MORINVILLE ST. ALBERT-BIG LAKE EXCELSIOR WESTLOCK CAMPBELL-NAMAO ATIM	MANNVILLE MANNVILLE MANNVILLE VIKING MANNVILLE MANNVILLE	56 40 33 203 10 2	4.8	) ) ) ) ) )
SYLVAN LAKE (HUDSON'S BAY)	SYLVAN LAKE & MEDICINE RIVER	MANNVILLE, MISSISSIPPIAN & LEDUC	430	23	9.9
SYLVAN LAKE (CHEVRON)	SYLVAN LAKE	MANNVILLE & MISSISSIPPIAN	253	19	14.8
TURNER VALLEY (BRITISH AMERICAN)	TURNER VALLEY	MISSISSIPPIAN	186	24	14.5
WATERTON (SHELL CANADA)	WATERTON	MISSISSIPPIAN & DEVONIAN	1232	13	16.0
WAYNE-ROSEDALE (CANADIAN PACIFIC-REDLAND)	WAYNE-ROSEDALE	VIKING & BLAIRMORE	187	4	0.7
WILLESDEN GREEN (TEXACO)	WILLESDEN GREEN	CARDIUM	78	31	2.4
WORSLEY (SHELL CANADA)	WORSLEY	LEDUC	135	7	0.9
SUB-TOTAL					336.3
EDMONTON LIQUID GAS (EDMONTON LIQUID GAS)					22.2
EXPRESS (PACIFIC PETROLEUMS)					99.3
COCHRANE (ALBERTA NATURAL GAS)					64.3
TOTAL FROM EXISTING OR APPROVED PLANT FACILITIES					528.1

TABLE A-5 (CONTINUED)

PLANT	FIELD OR AREA	ZONE	REMAINING MARKETABLE RESERVES OF NATURAL GAS (Bcf)	PROPANE RECOVERY RATIOS BBL/MMCF OF MARKETABLE GAS	RECOVERABLE PROPANE (MILLIONS OF BARRELS)
<b>B. FROM FUTURE PLANT FACILITIES</b>					
BIGSTONE	LEDUC	250	22	5.5	(1)
FERRIER	CARDIUM	322	30	9.7	(2)
HOST PINE	BLAIRMORE	275	17	4.7	(3)
GILBY	BLAIRMORE, JURASSIC & RUNDLE	280	16	4.5	(4)
GOLD CREEK	CADOMIN, SPIRIT RIVER & WABAMUN	377	22	8.3	(5)
KAYBOB	NOTIKEWIN, CADOMIN & BEAVERHILL LAKE	429	15	6.4	(6)
KAYBOB SOUTH (HUDSON'S BAY)	BEAVERHILL LAKE	350	27	9.5	(7)
KAYBOB SOUTH (CHEVRON)	BEAVERHILL LAKE	700	27	18.9	(8)
MINNEHIK-BUCK LAKE	MISSISSIPPIAN	358	12	4.3	(9)
MITSUE	GILWOOD	160	60	9.6	(10)
NIPISI	GILWOOD	110	82	9.0	(11)
PEMBINA	LOBSTICK-EASYFORD	GLAUCONITIC & OSTRACOD	156	3.1	(12)
PROVOST	VIKING	427	6	2.6	(13)
QUIRK CREEK	MISSISSIPPIAN	450	14	6.3	(14)
SIMONETTE	WABAMUN & LEDUC	121	25	3.0	(15)

## A=29

TABLE A-5 (CONTINUED)

(1) PLANT	(2) FIELD OR AREA	(3) REMAINING MARKETABLE RESERVES OF NATURAL GAS (Bcf)	(4) MARKETABLE GAS	(5) PROPANE RECOVERY RATIOS BBL/MMCF OF MARKETABLE GAS	(6) RECOVERABLE PROPANE (MILLIONS OF BARRELS)
SURGEON LAKE SOUTH	TRIASSIC & LEDUC	84	40	3.4	
VULCAN	LITTLE BOW, LONG COULEE & VULCAN	76	11	0.8	
WIMBORNE	WIMBORNE	237	13	3.1	
	SUB-TOTAL			112.7	
	REPROCESSING OF GAS FROM FUTURE PLANT FACILITIES			12.9	
	TOTAL FROM FUTURE PLANT FACILITIES			125.6	
C.	LESS DECREASED RECOVERY FROM REPROCESSING PLANTS		50.9		
	TOTAL PROPANE RESERVE		596.8		

## APPENDIX B

### ALBERTA PROPANE REQUIREMENTS AND PERMIT COMMITMENTS

Appendix B presents a summary of the forecast prepared for Dome Petroleum Limited by Dr. E. C. Sievwright and the Board's current reassessment of its forecast published in 1965 in OGCB Report 65-11<sup>(1)</sup>. The period of protection the Board has set to conform with the date of reserve assessment is June 1, 1968 to May 31, 1998.

#### Views of Dome Petroleum Limited - Dr. E. C. Sievwright's Study

##### (1) Alberta Requirements

The forecast of Alberta requirements showed an average annual growth rate of total demand of 3.7 per cent over the period 1968 to 1998. It was contended that the difference between this rate and the somewhat higher rates which were obtained over the historical period 1956 to 1967 was largely attributable to the high degree of saturation already achieved in many rural markets and the severity of competition from natural gas in such areas.

Three sectors of demand were considered in the preparation of the forecast: LPG distributors, petrochemical consumption and miscible flood requirements.

A previous forecast prepared by Dr. Sievwright had been submitted to the Board in connection with the application by

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(1) Report on the Applications for Permits Authorizing the Removal of Propane from the Province of Canadian Hydrocarbons Limited and The British American Oil Company Limited under The Gas Resources Preservation Act, 1956. September 1965.

Canadian Hydrocarbons Limited in 1965, which the Board summarized and reviewed in OGCB Report 65-11. Dr. Sievwright suggested that his present forecast differed little in aggregate from his prior projection. However, the levels of both miscible flood and petrochemical demand have been reduced. On the other hand, LPG distributor consumption has been increased. Each of these sectors of demand is reviewed in more detail below.

LPG Distributors. An average annual growth rate of 3.7 per cent was adopted for LPG distributors' demand. It was anticipated that the development of rural natural gas distribution systems would have a dampening effect on demand for propane. Such systems were predicated on the present availability of plastic pipe suitable for gas transmission and the development of new methods of pipe installation. In testimony, Dr. Sievwright referred to discussions with a major propane distributor which he averred indicated the concern of the distributor with the impact of such systems on its market. Dr. Sievwright had reviewed the end use categories involved in the distributors' forecast - domestic, commercial, carburetion and industrial - in relation to the previous forecast, but did not believe the changes exhibited were of significant interest, although carburetion requirements appeared to be in excess of the level anticipated in 1965, while the converse applied to space heating. The applicants anticipated the possibility of a considerable extension of carburetion markets in the future, particularly with changing technology. In relation to the earlier forecast, the major

change had occurred in the initial level of consumption, while in Dr. Sievwright's view the pattern of growth had not altered appreciably.

Total LPG distributors' consumption was anticipated to increase from some 6,000 barrels per day in 1968 to 17,700 barrels per day in 1998, with requirements over the 30-year period 1969 to 1998 amounting to some 125 million barrels.

Petrochemical Demand. The applicants expected that petrochemical demand for propane in Alberta would increase at an average annual rate of 4.4 per cent over the forecast period. The forecast did not allow for the location in Alberta of new plants designed to use propane as a raw material. It was assumed that future petrochemical developments in Alberta would be based upon feedstocks other than propane. In support of this argument, Dr. Sievwright contended that the fact that no new plants were built in the Province during the years of low-priced propane suggested that this eventuality was less likely with the apparent higher level of propane prices currently established. Furthermore, Dr. Sievwright believed ethane and butane would constitute logical feedstocks for future expansion, particularly given the difficulties of moving ethane from the Province. He also referred to a surplus of ethylene capacity for eastern Canada which was anticipated to impair the economics of additional petrochemical expansion in Alberta.

Petrochemical demand was anticipated to rise from 3,800 barrels per day in 1968 to 13,500 barrels per day by 1998; over

the 30-year period 1969 to 1998, total requirements amounted to some 85 million barrels.

Miscible Flood Demand. Dr. Sievwright indicated that miscible flood requirements constituted a difficult forecasting problem. Based on anticipated rates of consumption for the next two years an annual requirement of 1,000 barrels per day over the forecast period was assumed. Hence, total requirements over the 30-year period 1969 to 1998 amounted to some 11 million barrels.

In total, Alberta requirements were anticipated to rise from some 10,900 barrels per day in 1968 to 32,200 barrels per day in 1998 with a total 30-year requirement for the period 1969 to 1998 of some 222 million barrels.

#### (2) Permit Commitments

The applicants presented a tabulation of permit commitments under the four subsisting permits granted to Canadian Hydrocarbons, Pacific Petroleum, British American and Home Oil respectively. With respect to the Canadian Hydrocarbons and British American permits, it was assumed that additional purchase contracts would be made by the permittees up to the maximum allowed in the permits. In total, permit commitments were estimated at some 23,100 barrels per day in 1968, rising to some 23,700 barrels per day in 1970, falling thereafter to a level of 1,700 barrels per day in 1987 and to zero in 1988 and subsequent years. Thus, total permit commitments requirements amounted to some 122 million barrels.

Views of the Board

## (1) Alberta Requirements

The Board reviewed its 1965 forecast in the light of the evidence submitted by the applicant and the intervener, Chemcell, the performance of the forecast since its publication and other pertinent factors. Each component of demand is appraised below.

LPG Distributors' Demand. The deficiency between actual and forecast consumption in this category of demand in 1967 amounted to some 7.5 per cent. The Board considered the significance of this discrepancy particularly in relation to the impact on potential propane markets of extensions in the areas served by natural gas.

On the basis of information supplied by Canadian Western Natural Gas Company Limited (Canadian Western) the rate of expansion of gas supply to new communities was appraised. The information indicated that this expansion in the gas market had been considerably more rapid than envisaged at the time of the preparation of the 1965 forecast. Thus, a part of the fuel market previously estimated as available for penetration by propane has already fallen to natural gas. It is also likely that the main effect of the more rapid extension of gas service is to reduce the potential market for domestic and commercial propane consumption. The Board's data indicate that domestic and commercial sales probably account for some 90 per cent of the distributors' total.

The Board also examined the issue raised by Dr. Sievwright:

the impact of the development of plastic pipe suitable for gas transmission on propane markets. This innovation was anticipated to enhance the economic feasibility of supplying gas to more isolated settlements and farms. The Board drew on the assistance of Canadian Western in appraising the significance of this factor. Canadian Western supplied estimates of the number of new customers to be served with gas by plastic pipe in its own and Northwestern Utilities, Limited's areas. These data indicated to the Board that the reduction of propane consumption attributable to plastic pipe developments will probably be less than 100 barrels per day per year. With respect to the near term, the utility companies expressed doubts as to the competitiveness of this type of supply in view of the substantial user installation costs. Over the longer term, the utility companies are optimistic that changes in technology will enhance the economic attractiveness of gas supplied in this manner. Thus, on the basis of this analysis it seemed realistic to the Board to assume that plastic pipe may begin to make significant inroads into the potential propane market sometime in the late 1970's.

In assessing the degree to which the Board's 1965 distributors' projection should be changed to reflect the factors discussed above, the Board did not have the benefit of new, detailed evidence with respect to end use data, market penetration and per customer usage for propane. Dr. Sievwright indicated that his forecast represented a readjustment of his previous projection rather than a completely new appraisal of

the market. Moreover the lack of detailed historical data precludes the Board from establishing precisely which elements of the 1965 forecast were responsible for the error experienced in 1967. However, the Board notes that the extension in the market for natural gas has been more rapid than anticipated in the 1965 forecast and that this factor will probably act to reduce any tendency in the 1965 forecast to underestimate over the long term. Overall, in view of these considerations, the Board has decided not to undertake the preparation of a new forecast at this time. Rather, some adjustments have been made to the 1965 forecast. In particular, over the near term an adjusted schedule of requirements has been adopted up to the mid-1970's to eliminate the current forecast error. This adjustment is approximately equivalent to advancing by one year the 1965 estimates. In subsequent years, growth was reduced such that annual requirements in the later forecast years were close to the 1965 forecast. This is consistent with the fact that no fundamental reappraisal has been made of the 1965 long term forecast. Moreover, the reduction in growth as compared to the 1965 forecast is intended to reflect the smaller scope for expansion of the fuel market available to propane resulting from the actual and prospective extensions to areas supplied by gas referred to above.

The Board adjusted forecast, the 1965 forecast and Dome's projection are shown in Table B-1. The Board now anticipates distributor requirements will increase from some 6,400 barrels

per day in 1969 to 14,200 barrels per day in 1998. Total 30-year requirements are forecast to be some 119 million barrels. This level is close to Dome's forecast. However, on a year by year basis, the Board anticipates a somewhat higher level of consumption in the earlier forecast years and a somewhat lower level beyond 1984 than Dome.

Miscible Flood Demand. In reviewing this component, the Board has maintained its previous distinction between non-self-sustaining and self-sustaining demand. The requirements which the Board includes in its forecast relate to the non-self-sustaining category, defined as that portion of miscible flood requirements for propane which are satisfied by propane production included in the Board's supply projection.

The comparison of the 1965 forecast and actual consumption indicated considerable year by year errors, with a deficiency experienced in aggregate. Accordingly, the Board decided to undertake a complete review of non-self-sustaining miscible flood requirements.

The review embraced a study of the likelihood of the institution of miscible flood schemes in currently developed pools and an assessment of an allowance for schemes in presently undiscovered or undeveloped pools. In appraising the suitability of miscible flood techniques for currently developed pools, consideration was given to the incentives for the introduction of enhanced recovery schemes under the proration plan, the impact of new enhanced recovery techniques and the possibility of future

increases in propane prices. An established requirement is the currently approved miscible flood scheme in the Bear Lake Cardium Unit of the Pembina Field. The Wizard Lake D-3 A Pool and the Glen Park D-3 A Pool were considered as suitable candidates for non-self-sustaining miscible flooding. With respect to the Wizard Lake Pool, the Board's estimates of propane for the requirements for the Wizard Lake Pool were based on information supplied by Texaco Exploration Company. The requirements for Glen Park D-3 A Pool were based on the Board's own assessment and on discussions with the operator involved. It was also deemed prudent to make an allowance mainly relating to start up requirements for a self-sustaining scheme which may be introduced in the St. Albert Big Lake D-3 Pool.

In assessing requirements for presently undiscovered or undeveloped pools, the Board believes that an amount corresponding to average historical rates is appropriate. Accordingly, a level of 1,200 barrels per day was adopted which is close to the average non-self-sustaining requirements over the period 1960 to 1967. The Board's current forecast recognizes the likelihood that several self-sustaining miscible flood schemes may be instituted and that this type of operation is particularly attractive for suitable reservoirs developed in the more remote areas of the Province, such as Rainbow-Zama. However, the self-sustaining nature of such schemes precludes their inclusion in the projection.

Table B-2 shows the Board's 1968 and 1965 forecasts and Dome's projection. The Board currently forecasts that miscible flood

requirements will commence at some 1,750 barrels per day in 1969, rise to 2,900 barrels per day in 1971 and reach a level of 1,200 barrels per day in 1983, at which time it was assumed that all suitable currently developed pools would have been miscibly flooded.<sup>12</sup> The constant requirements subsequent to 1983 relate to presently undiscovered and undeveloped pools.<sup>13</sup> The total requirement over the 30-year period 1969 to 1998 is some 18 million barrels.<sup>14</sup> This amount is considerably in excess of the 1965 forecast and primarily reflects additional propane requirements for schemes that the Board believes are probable in nature, while the slight increase in the long term rate reflects the deficiency in the forecast experienced over the last three years. In the case of this forecast, the Board recognizes the difficulty of estimating requirements on a year by year basis.<sup>15</sup> It is over a period of years that the Board believes its estimates are reasonable.

Petrochemical Demand. The error in the 1965 petrochemical forecast has been progressively reduced and in 1967 amounted to an underestimate of some 3.6 per cent.<sup>16</sup> Chemcell presented evidence at the hearing which indicated its agreement with the Board's previous forecast. Accordingly, given the reasonable magnitude of the forecast error and Chemcell's adoption of the Board's previous forecast, at this time the Board decided to make no alteration to its 1965 projection for the Chemcell plant.<sup>17</sup> However, the Board has decided to limit the petrochemical category to the requirements for this plant.<sup>18</sup> Consequently, the allowance in the 1965 forecast for new petrochemical plants has been transferred to

the contingency category discussed below. Table B-3 shows the Board's 1968 and 1965 forecast and Dome's projection. The Board currently estimates that petrochemical propane consumption will increase from 3,800 barrels per day in 1969 to 12,500 barrels per day in 1998, with requirements over the 30-year period totalling some 89 million barrels. The Board's forecast is close to Dome's for the 30-year period in total, but some differences are exhibited on a year by year basis, with the Board forecast generally exceeding Dome's up to 1993 while the converse applies in the remaining years.

Contingency Allowance. In the Board's 1965 forecast an allowance was made for petrochemical requirements relating to the possibility of new petrochemical plants, one in 1970 and one in 1980, each with a constant annual propane requirement of 1,500 barrels per day. The Board still believes it prudent to make provision for developments of this nature. However, the Board has decided that such an allowance would best be treated as a general contingency rather than being specifically attributed to the petrochemical demand category. Accordingly, a general contingency allowance related to the volume of petrochemical plant requirements assumed in the 1965 forecast has been adopted by the Board. However, to avoid large discrete changes in the year by year requirements, the allowance has been distributed evenly over the period 1970 to 1998 as shown in Table B-4. The contingency allowance commences at some 500 barrels per day in 1970, rising to 3,400 barrels per day in 1998. Total 30-year requirements

amount to some 20 million barrels.

Total Demand. Table B-5 shows a comparison of the Board's 1968 and 1965 forecasts and Dome's projection for total demand for propane in Alberta. The Board currently forecasts that propane consumption within Alberta will rise from 11,950 barrels per day in 1969 to 31,300 barrels per day in 1998. The 30-year requirements total some 247 million barrels. The increase in 30-year requirements over the Board's 1965 forecast reflects the net effect of changes in the categories of demand reviewed above. On an annual basis, the Board's 1968 projection exceeds the 1965 forecast over the period 1969 to 1979 inclusive, whereas the converse is the case over the period 1980 to 1988 inclusive; after 1989, annual requirements are again greater in the 1968 forecast. In relation to Dome's forecast, the increase in 30-year requirements is some 25 million barrels. Dr. Sievwright forecast lower but converging levels of annual demand up to 1995. Subsequently to 1995, the combination of a rapid increase in distributors' and petrochemical demand in Dr. Sievwright's forecast results in higher total annual demand than under the Board's 1968 projection.

The adjustment of the Board's calendar year forecast to relate to the 30-year period June 1, 1968 to May 31, 1998, is as follows:

	<u>Million Barrels</u>
Alberta requirements January 1, 1969 to December 31, 1998	247
Plus estimated requirements June 1, 1968 to December 31, 1968	2

	<u>Million Barrels</u>
Less estimated requirements June 1, 1998 to December 31, 1998	6
Alberta requirements June 1, 1968 to May 31, 1998	243

Therefore, the Board estimates Alberta requirements for the 30-year period June 1, 1968 to May 31, 1998 to total some 243 million barrels.

#### (2) Permit Commitments

Present permit commitments consist of the amounts approved under Canadian Hydrocarbons' Permit No. CH 65-1, Pacific Petroleum's Permit No. PP 66-2, as amended, the British American Permit No. BA 66-2 and the Home Oil Company Limited's Permit No. HO 66-1.

Canadian Hydrocarbons' permit is for a term from November 1, 1966, to October 31, 1986, with maximum amounts for consecutive 12-month periods declining from some 2,100 barrels per day in 1967 to some 1,500 barrels per day for 1974 and subsequent periods. Pacific Petroleum's permit runs from November 1, 1965 to October 31, 1987. An amendment to the permit provides for the removal from the Province by the permittee of amounts of propane equal to the lesser of 115 per cent of the amounts prescribed in the permit for the 12-month periods between November 1, 1965 and October 31, 1983 or the actual production from the Empress processing plant. The Board's forecast of production from the Empress plant is shown in Appendix A of this Report. Under the amended permit, maximum amounts for consecutive 12-month periods begin at 9,800 barrels per day in 1966 and increase to 12,650 barrels per day from 1970 to 1979 inclusive, declining thereafter to 1,700 barrels per

day by 1987. British American's Permit No. BA 66-2 has a term from October 1, 1966, to September 30, 1976. The maximum amount for consecutive 12-month periods is 7,800 barrels per day throughout the term of the permit. Home Oil Company Limited's Permit No. HO 66-1 has a term from March 1, 1967 to February 28, 1987. The maximum amount for consecutive 12-month periods is 1,350 barrels per day.

Total permit commitments as shown in Table B-6 rise marginally in 1970 and fall gradually thereafter to 1,700 barrels per day by 1987, resulting in overall 30-year commitments of some 114 million barrels. The corresponding total for the 30-year period June 1, 1968 to May 31, 1998 is some 119 million barrels.

TABLE B-1

FORECAST OF DISTRIBUTORS' REQUIREMENTS FOR  
PROPANE IN ALBERTA 1969 - 1998  
(BARRELS PER DAY)

<u>Year</u>	<u>Board 1965</u>	<u>Dome</u>	<u>Board Adjusted 1968</u>
1969	6,000	6,330	6,400
1970	6,400	6,646	6,800
1971	6,800	6,910	7,200
1972	7,300	7,190	7,600
1973	7,700	7,470	8,000
1974	8,200	7,770	8,400
1975	8,400	8,080	8,800
1976	9,000	8,400	9,200
1977	9,400	8,740	9,500
1978	10,000	9,090	9,800
1979	10,600	9,450	10,100
1980	10,700	9,830	10,400
1981	10,800	10,200	10,700
1982	11,000	10,600	11,000
1983	11,100	11,000	11,200
1984	11,300	11,400	11,400
1985	11,400	11,800	11,600
1986	11,700	12,200	11,800
1987	11,700	12,600	12,000
1988	11,900	13,000	12,200
1989	12,000	13,400	12,400
1990	12,200	13,800	12,600
1991	12,200	14,200	12,800
1992	12,400	14,700	13,000
1993	12,500	15,200	13,200
1994	12,700	15,700	13,400
1995	12,800	16,200	13,600
1996	12,900	16,700	13,800
1997	13,000	17,200	14,000
1998	13,100	17,700	14,200
<b>30-Year Requirement-</b>			
Mbbl.	115,778	125,379	119,392
<b>Average Annual Growth</b>			
Rate, Initial to			
Terminal Year	2.7	3.6	2.8

TABLE B-2

FORECAST OF MISCELLY FLOOD REQUIREMENTS FOR  
PROPANE IN ALBERTA 1969 - 1998  
(BARRELS PER DAY)

<u>Year</u>	<u>Board 1965</u>	<u>Dome</u>	<u>Board Adjusted 1968</u>
1969	700	1,100	1,750
1970	1,000	1,000	2,450
1971	1,000	1,000	2,900
1972	1,000	1,000	2,200
1973	1,000	1,000	2,200
1974	1,000	1,000	2,200
1975	1,000	1,000	1,900
1976	1,000	1,000	1,900
1977	1,000	1,000	1,900
1978	1,000	1,000	1,900
1979	1,000	1,000	1,900
1980	1,000	1,000	1,900
1981	1,000	1,000	1,900
1982	1,000	1,000	1,900
1983	1,000	1,000	1,200
1984	1,000	1,000	1,200
1985	1,000	1,000	1,200
1986	1,000	1,000	1,200
1987	1,000	1,000	1,200
1988	1,000	1,000	1,200
1989	1,000	1,000	1,200
1990	1,000	1,000	1,200
1991	1,000	1,000	1,200
1992	1,000	1,000	1,200
1993	1,000	1,000	1,200
1994	1,000	1,000	1,200
1995	1,000	1,000	1,200
1996	1,000	1,000	1,200
1997	1,000	1,000	1,200
1998	1,000	1,000	1,200
<b>30-Year Requirement-</b>			
Mbbl.		10,841	17,557

TABLE B-3

FORECAST OF PETROCHEMICAL REQUIREMENTS FOR  
PROPANE IN ALBERTA 1969 - 1998  
(BARRELS PER DAY)

<u>Year</u>	<u>Board 1965</u> <sup>(1)</sup>	<u>Dome</u>	<u>Board Adjusted 1968</u>
1969	3,700	3,900	3,800
1970	5,500	4,100	4,000
1971	6,100	4,300	4,600
1972	6,500	4,500	5,000
1973	6,900	4,700	5,200
1974	6,900	4,900	5,400
1975	6,900	5,100	5,600
1976	7,400	5,300	5,900
1977	7,700	5,500	6,200
1978	8,000	5,700	6,500
1979	8,300	5,900	6,800
1980	10,100	6,200	7,100
1981	10,400	6,500	7,400
1982	10,700	6,800	7,700
1983	11,000	7,100	8,000
1984	11,300	7,400	8,300
1985	11,600	7,700	8,600
1986	11,900	8,000	8,900
1987	12,200	8,400	9,200
1988	12,500	8,800	9,500
1989	12,800	9,200	9,800
1990	13,100	9,600	10,100
1991	13,400	10,000	10,400
1992	13,700	10,500	10,700
1993	14,000	11,000	11,000
1994	14,300	11,500	11,300
1995	14,600	12,000	11,600
1996	14,900	12,500	11,900
1997	15,200	13,000	12,200
1998	15,500	13,500	12,500
30-Year Requirement-Mbb	1.115,742	85,264	89,498
Average Annual Growth Rate, Initial to Terminal Year	5.1	4.4	4.2

(1) Includes a contingency allowance, which is treated separately in the 1968 forecast (See Table B-4)

TABLE B-4

CONTINGENCY ALLOWANCE FOR  
PROPANE IN ALBERTA 1969 - 1998  
(BARRELS PER DAY)

<u>Year</u>	<u>Board Adjusted 1968</u>
1969	-
1970	500
1971	600
1972	700
1973	800
1974	900
1975	1,000
1976	1,100
1977	1,200
1978	1,300
1979	1,400
1980	1,500
1981	1,600
1982	1,700
1983	1,800
1984	1,900
1985	2,000
1986	2,100
1987	2,200
1988	2,300
1989	2,400
1990	2,500
1991	2,700
1992	2,800
1993	2,900
1994	3,000
1995	3,100
1996	3,200
1997	3,300 <sup>a</sup>
1998	3,400
30-Year Requirement-Mbbl.	20,404

TABLE B-5

FORECAST OF TOTAL REQUIREMENTS FOR  
PROPANE IN ALBERTA 1969 - 1998  
(BARRELS PER DAY)

<u>Year</u>	<u>Board 1965</u>	<u>Dome</u>	<u>Board Adjusted 1968</u>
1969	10,400	11,300	11,950
1970	12,900	11,746	13,750
1971	13,900	12,210	15,300
1972	14,800	12,690	15,500
1973	15,600	13,170	16,200
1974	16,100	13,670	16,900
1975	16,300	14,180	17,300
1976	17,400	14,700	18,100
1977	18,100	15,240	18,800
1978	19,000	15,790	19,500
1979	19,900	16,350	20,200
1980	21,800	17,030	20,900
1981	22,200	17,700	21,600
1982	22,700	18,400	22,300
1983	23,100	19,100	22,200
1984	23,600	19,800	22,800
1985	24,000	20,500	23,400
1986	24,600	21,200	24,000
1987	24,900	22,000	24,600
1988	25,400	22,800	25,200
1989	25,800	23,600	25,800
1990	26,300	24,400	26,400
1991	26,600	25,200	27,100
1992	27,100	26,200	27,700
1993	27,500	27,200	28,300
1994	28,000	28,200	28,900
1995	28,400	29,200	29,500
1996	28,800	39,200	30,100
1997	29,200	31,200	30,700
1998	29,600	32,200	31,300
30-Year Requirement-Mbb1.	242,361	221,630	246,851
Average Annual Growth Rate, Initial to Terminal Year	3.7	3.7	3.4

TABLE B-6

Permit Commitments 1969-1998

(Barrels Per Day)

<u>Year</u>	<u>Permit No. CH 65-1* Canadian Hydrocarbons</u>	<u>Permit No. PP 66-2 Pacific Petroleums</u>	<u>Permit No. BA 66-2 British American</u>	<u>Permit No. HO 66-1* Home Oil</u>	<u>Total Commitments</u>
1969	2,040	12,500	7,800	1,350	23,690
1970	1,910	12,650	7,800	1,350	23,710
1971	1,770	12,650	7,800	1,350	23,570
1972	1,750	12,650	7,800	1,350	23,550
1973	1,610	12,650	7,800	1,350	23,410
1974	1,480	12,650	7,800	1,350	23,280
1975	1,480	12,650	7,800	1,350	23,280
1976	1,480	12,650	7,800	1,350	23,280
1977	1,480	12,650	-	1,350	15,480
1978	1,480	12,650	-	1,350	15,480
1979	1,480	12,650	-	1,350	15,480
1980	1,480	11,730	-	1,350	14,560
1981	1,480	11,040	-	1,350	13,870
1982	1,480	10,240	-	1,350	13,070
1983	1,480	9,430	-	1,350	12,260
1984	1,480	6,300	-	1,260	9,040
1985	1,480	4,700	-	1,120	7,300
1986	1,480	2,700	-	970	5,150
1987	-	1,700	-	-	1,700
1988	-	-	-	-	-
1989	-	-	-	-	-
1990	-	-	-	-	-
1991	-	-	-	-	-
1992	-	-	-	-	-
1993	-	-	-	-	-
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	-	-	-	-	-
1997	-	-	-	-	-
1998	-	-	-	-	-

30-Year  
Commitments  
Commencing  
June 1, 1968      10  
(Millions of Barrels)

72

23

9

114

\* The Board has assumed that the additional purchase contracts will be obtained by the permittee, up to the maximum allowed in the permit.

## APPENDIX C

### THE MEETING OF THE PRESENT AND FUTURE REQUIREMENTS OF ALBERTA FOR PROPANE AND THE PERMIT COMMITMENTS, AND THE RESULTING SURPLUS

#### Views of the Applicant

Dome and Pan American, at the hearing of their application, presented a propane supply-demand balance for the Province for the period 1969 to 1998 inclusive. The commitments for the removal of propane from the Province as included in the balance reflect the permit commitments existing at the time the application was made. In the case using three years growth of gas reserves the balance shows a surplus of some 16,000 barrels per day in 1969 increasing to 37,000 barrels per day in 1986. The surplus then declines to some 3,000 barrels per day in 1998. If the growth of gas reserves continues at 2.5 trillion cubic feet per year throughout the forecast period, the surplus increases from 16,000 barrels per day in 1969 to 187,000 barrels per day in 1998.

The applicants estimated the surplus over the 30-year period, 1969 to 1998, to be 252 million barrels in the first case and 1,138 million barrels in the second.

#### Views of the Board

As discussed in earlier Board reports dealing with the removal of propane from the Province, the Board believes that there are three tests which must be satisfied in protecting for Alberta's requirements. The first test involves comparison of the total propane reserves (including those associated with two years growth of gas reserves) to the total 30-year requirements. The second

test involves a year by year supply-demand balance for the longer of the term of the permit that might be granted on the application or the term of the longest existing permit to remove propane from the Province. The final test is a substitute for a year by year supply-demand balance for the remainder of the 30-year period of protection and involves a comparison of the propane reserves remaining at the end of the period analysed on a year by year basis to the total requirements for the remainder of the 30-year period.

(1) Total Balance

The Board has compared the reserve and requirement estimates presented and described in detail in Appendices A and B. The comparison and the resulting surplus are shown in Table C-1.

The table shows that the propane reserves from existing processing plant facilities as estimated by the Board are some 237 million barrels greater than the total 30-year requirements and present permit commitments. If the reserves from future processing plant facilities are included, the surplus increases to 312 million barrels. The Board considers that greater weight should be placed on the latter figure.

(2) Balance on a Year by Year Basis

The Board has reviewed its studies referred to in OGCB Report 65-11<sup>(1)</sup> regarding the ability of the Provincial propane production

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(1) Report on the Applications for Permits authorizing the Removal of Propane from the Province of Canadian Hydrocarbons Limited and The British American Oil Company Limited Under The Gas Resources Preservation Act, 1956; September 1965.

to meet seasonal peak demand for this product, the role of storage in the meeting of this demand, and the regional distribution of propane production and demand. On the basis of this review the Board remains of the opinion that for the present time it is appropriate to carry out its analysis of the yearly supply-demand balance on an annual and a Province-wide basis.

Table C-2 presents a supply-demand balance for the period 1969 to 1994 inclusive, based on the Board's estimates of supply and demand as presented in Appendices A and B. The table shows two cases: one reflecting production from existing propane recovery facilities and two years growth of gas reserves, and the other including future processing facilities. The production requirements and commitments have been taken from Tables A-4, B-5 and B-6 respectively.

The table shows that for the case of propane production from existing facilities and two years growth of gas reserves, a surplus of some 13,000 barrels per day exists commencing in 1969. The surplus increases to about 30,000 barrels per day by 1977. It then declines to the extent that a small deficiency exists for the years 1993 and 1994. Including production from future processing facilities, the projected surplus increases from 13,000 barrels per day in 1969 to 42,000 barrels per day in 1977, and then declines to some 4,000 barrels per day by 1994.

The Board's forecast surplus including future processing plant facilities is essentially the same as that forecast by Dome and Pan American. If, however, the comparison is made with

the applicants' second case, that is, gas reserve appreciation throughout the forecast period at the long term rate of 2.5 trillion cubic feet per year, the Board's surplus is of course, considerably less.

(3) Balance for Remainder of 30-Year Period

Table C-3 has been prepared as a substitute for a year by year supply-demand balance for the remainder of the 30-year period. It is a comparison of the remaining propane reserves as of the end of 1994 (the end of the 25 years for which the Board is prepared to consider a permit) to the total requirements of the Province for the remainder of the 30-year period, 1995 to 1998 inclusive. The table presents two cases: one reflecting production from existing processing facilities and two years growth of gas reserves, and the other including future facilities.

The table shows that the remaining reserves at the end of the possible 25-year term of the permit applied for will be 119 million barrels for the case of existing facilities or 111 million barrels including future facilities. It also shows that the total requirements for the remainder of the 30-year period will be 45 million barrels. This results in a surplus of the then remaining reserves over the requirements for the remainder of the period of protection of 74 million barrels for the case of existing facilities or 66 million barrels including future facilities. While the question may arise as to whether a sufficient portion of the reserves can be produced to satisfy the requirements for the remainder of the period of protection, the possibility of the use of

propane storage during the years just prior to 1994 and over the remainder of the 30-year period, and the possibility that if necessary production can be to some extent deferred, convinces the Board that the requirements for the remainder of the 30 years can be satisfied with the reserves remaining at the end of 1994.

TABLE C-1

PROPANE SURPLUS AS ESTIMATED BY THE BOARD  
 NOT INCLUDING THE QUANTITIES APPLIED FOR  
 (MILLIONS OF BARRELS)

	FROM EXISTING PLANT FACILITIES	INCLUDING FUTURE PLANT FACILITIES
<u>PROPANE RESERVES</u>		
RESERVES FROM ESTABLISHED GAS RESERVES	522	597
RESERVES FROM TWO YEARS GROWTH OF GAS RESERVES	76	76
	—	—
TOTAL RECOVERABLE PROPANE RESERVES	598	673
<u>PROPANE REQUIREMENTS</u>		
30-YEAR ALBERTA REQUIREMENTS	247	247
EXISTING PERMIT COMMITMENTS	114	114
	—	—
TOTAL RESERVES NEEDED TO MEET ALBERTA REQUIREMENTS AND PERMIT COMMITMENTS	361	361
 SURPLUS		
	237	312

TABLE C-2.

PROPANE SUPPLY-DEMAND BALANCE ESTIMATED BY THE BOARD  
NOT INCLUDING QUANTITIES APPLIED FOR  
(BARRELS PER DAY)

YEAR	AVAILABILITY			SURPLUS	
	FROM EXISTING PROCESSING PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	ALBERTA REQUIREMENTS AND EXISTING PERMIT COMMITMENTS	FROM EXISTING PROCESSING PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES
1969	48,700	48,700	35,600	13,100	13,100
1970	55,600	65,900	37,500	18,100	28,400
1971	58,800	73,400	38,900	19,900	34,500
1972	61,800	76,500	39,100	22,700	37,400
1973	63,200	78,000	39,600	23,600	38,400
1974	63,800	78,700	40,200	23,600	33,500
1975	65,100	79,200	40,600	24,500	38,600
1976	64,700	77,600	41,400	23,300	36,200
1977	64,100	75,800	34,300	29,800	41,500
1978	63,800	74,200	35,000	28,800	39,200
1979	64,400	73,500	35,700	28,700	37,800
1980	65,000	72,500	35,500	29,500	37,000
1981	65,100	71,700	35,500	29,600	36,200
1982	61,800	68,000	35,400	26,400	32,600
1983	55,400	61,700	34,500	20,900	27,200
1984	48,600	55,000	31,800	16,800	23,200
1985	46,800	53,200	30,700	16,100	22,500
1986	44,500	51,000	29,200	15,300	21,800
1987	38,500	45,000	26,300	12,100	18,700
1988	36,400	43,000	25,200	11,200	17,800
1989	34,900	41,400	25,800	9,100	15,600
1990	31,300	37,700	26,400	4,900	11,300
1991	30,100	36,400	27,100	3,000	9,300
1992	29,100	35,300	27,700	1,400	7,600
1993	28,100	34,200	28,300	- 200	5,900
1994	26,900	33,200	28,900	-2,000	4,300
TOTAL - (MILLIONS OF BARRELS	479	562	316	163	244

TABLE C-3

PROPANE SURPLUS REMAINING AT THE END OF THE 30-YEAR PERIOD  
 NOT INCLUDING THE QUANTITIES APPLIED FOR  
 (MILLIONS OF BARRELS)

	<u>FROM EXISTING PROCESSING PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES</u>	<u>INCLUDING FUTURE PROCESSING PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES</u>
TOTAL RECOVERABLE PROPANE RESERVES	598	673
PRODUCTION DURING THE POSSIBLE TERM OF APPLIED FOR PERMIT - TO THE END OF 1994	479	562
PROPANE RESERVES REMAINING AT THE END OF 1994	119	111
TOTAL REQUIREMENTS INCLUDING EXISTING PERMIT COMMITMENTS	361	361
REQUIREMENTS DURING POSSIBLE TERM OF APPLIED FOR PERMIT - TO THE END OF 1994	316	316
REQUIREMENTS FOR REMAINDER OF 30-YEAR PERIOD (1955-1998)	45	45
SURPLUS	74	66

APPENDIX D

THE APPLICATION OF DOME PETROLEUM LIMITED  
AND PAN AMERICAN CANADA OIL COMPANY, LTD.  
FOR AUTHORIZATION FOR THE REMOVAL OF PROPANE  
AND THE SURPLUS WHICH WOULD RESULT IF  
THE APPLICATION WERE GRANTED

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Dome and Pan American's application for authorization to remove propane from the Province has been reduced as mentioned in Section V to a volume of 134,700,000 barrels over a 25-year term beginning November 1, 1969. The average quantity on a daily basis, removed under such a permit would be 15,000 barrels per day. The propane would come from the Cochrane, Edmonton Liquid Gas, Kaybob South, Provost, Pembina (Goliad), Vulcan, Gilby (Texaco), Lobstick-Easyford, Carson Creek, and Carstairs plants.

Dome and Pan American presented evidence at the hearing indicating that they own or control 100 per cent of the propane production at the Cochrane, Edmonton Liquid Gas, Provost, and Vulcan plants; some 17 per cent at Kaybob South and Pembina (Goliad), 28 per cent at Gilby (Texaco), 56 per cent at Lobstick-Easyford, 5 per cent at Carson Creek and 6 per cent at the Carstairs plant. When these percentages are applied to the Board's projected propane production for the plants, Dome and Pan American's share of the production is such that, on the basis of the rules respecting the relationship of volumes under contract to permit volumes as set out in pages 47 and 48 of OGCB Report 65-11<sup>(1)</sup>, they do not qualify for the requested volume of 15,000 barrels per day.

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(1) Report on the Applications for Permits Authorizing the Removal of Propane from the Province of Canadian Hydrocarbons Limited and The British American Oil Company Limited under The Gas Resources Preservation Act, 1956. September 1965.

The Board's policy states that,

- (a) the volumes specified in a permit shall not exceed either those applied for or those which the Board expects to be available in the fields or processing plants from which the permittee may remove propane, and
- (b) where the permittee does not own or have under contract the full volumes applied for, the permit volumes shall, subject to rule (a) above, be
  - (i) for the first two years of the term of the permit, 167 per cent of the volumes for such years owned or under contract, and
  - (ii) for the third and subsequent years of the term of the permit, 110 per cent of the volumes for such years owned or under contract.

Furthermore, the volumes specified in the permit would be increased if the applicants can satisfy the Board within 21 months from the commencement of the term of the permit that they have contracted for additional purchases of propane at the plants named in the permit. The maximum annual permit volumes for the third and subsequent years would be increased by 110 per cent of the additional volumes contracted for up to a maximum normally related to the lesser of the first two years volumes, to the volumes applied for, or to the volumes the Board expects to be available at the processing plants named in the permit.

In the case of this application no additional volumes can be included in the proposed permit in the third and subsequent years since the volumes now owned or controlled by Dome and Pan American in the 3rd to 17th year of the term of the permit are essentially equal to the volumes in the first and second years of the term.

Moreover, the applicants did not indicate any intention of acquiring additional volumes of propane from the plants that would be named in the permit.

A substantial portion of the volumes applied for by the applicants would come from plants in which they own or control all of the production. The applicants, therefore, will be unable to contract for additional volumes from such plants. The remaining portion of the volumes are expected to be produced from plants in which the production will be partially owned or controlled by the applicants. Rule (b) above can thus be applied to those volumes only. Table D-1 sets out in column 2 the Board's estimate of the volumes available to the applicant from plants where they own or control 100 per cent of the production. Column 3 shows the volumes owned or controlled by the applicants in the other plants from which they propose to take propane. There are additional volumes of propane produced at the latter plants that are not now controlled by the applicants, and which could perhaps be available to them. The additional volumes resulting from the application of the rule outlined previously to the volumes in column 3 are shown in column 4. The total volumes which could be included in a permit are shown in column 5. The totals con-

sist of the volumes in columns 2, 3 and 4. Column 6 shows the volumes in column 5 converted to annual quantities.

Table C-1 has shown that the propane reserves available from existing processing plant facilities are some 237 million barrels greater than the 30-year requirements of the Province and the permit commitments. If the adjusted application volumes (89.0 million barrels) are provided for, a surplus of some 148 million barrels remains. If the propane reserves associated with future processing facilities are considered, the surplus shown in Table C-1 is 312 million barrels and the granting of a permit for 89 million barrels would reduce it to 223 million barrels.

#### Balance on a Year by Year Basis

Table D-2 has been prepared to determine if the possible permit quantities are surplus on a year by year basis to Alberta's requirements and the permit commitments. The table presents two cases: one reflecting propane production from established reserves and existing recovery facilities plus two years growth of gas reserves, and the other including production from future processing facilities. The table covers the years 1969 to 1994 inclusive which are set out in column 1. Columns 2 and 3 have been taken from Table C-2 of this report and show the propane surplus to Alberta's requirements and the permit commitments as projected by the Board for the two previously mentioned cases. Column 4 shows the adjusted volumes that might result from the Dome and Pan American application and columns 5 and 6 present the resulting surplus for each case. The surplus has been rounded to the nearest 100 barrels per day.

The table shows that for the case of existing facilities plus two years growth of gas reserves, the adjusted permit quantities can be satisfied in the early years of the period under study when there would be a surplus of greater than 8,000 barrels per day. The surplus will then gradually decline to a more or less balanced position by 1989 and a deficit is predicted for the years 1990 to 1994 inclusive. If production from future facilities is included a surplus results in each but the terminal year of the 25-year period. The surplus will increase from some 13,000 barrels per day in 1969 to about 31,000 barrels per day in 1977. It will then decrease to about 300 barrels per day in 1993. A deficiency of 1,100 barrels per day is indicated in 1994. The requested volumes should, therefore, be further adjusted by reducing the volume that could be included in the permit in the terminal year of the term by 1,100 barrels per day to a new volume of 4,300 barrels per day.

Balance for Remainder of 30-Year Period

Table D-3 is a comparison of the remaining propane reserves as of the end of 1994 with the total requirements of the Province for the remainder of the 30-year period, 1994 to 1998 inclusive. The table presents two cases: one reflecting production from existing processing facilities and two years growth of gas reserves, and the other including future processing facilities.

The table shows that the reserves remaining at the end of the period studied in detail in Table D-2 will be 119 million

barrels for the case of existing facilities or 111 million barrels including future processing facilities. It also shows that the total requirements for the remainder of the 30-year period will be 45 million barrels. This results in a surplus of the then remaining reserves over the requirements for the remainder of the period of protection of 74 million barrels for the case of existing facilities or 66 million barrels including future processing facilities. Having in mind the possibility of the use of propane storage or the deferment of production, the Board is satisfied that the requirements for the portion of the 30-year period not studied in detail can be satisfied with the reserves remaining at the end of 1994.

TABLE D-1

## DETERMINATION OF PERMIT VOLUMES

(1)	(2)	(3)	(4)	(5)	(6)
YEAR	PROPANE AVAILABLE		ADDITIONAL VOLUMES FROM OTHER PLANTS (BARRELS/DAY)	TOTAL PERMIT VOLUMES	
	FROM WHOLLY OWNED PLANTS (BARRELS/DAY)	FROM OTHER PLANTS (BARRELS/DAY)		(BARRELS/DAY)	ANNUAL (THOUSANDS OF BARRELS)
1970	7,890	1,180	790	9,860	3,600
1971	9,300	1,720	1,150	12,170	4,440
1972	9,400	1,770	180	11,350	4,150
1973	9,370	1,690	170	11,230	4,100
1974	9,380	1,570	160	11,110	4,060
1975	9,340	1,480	150	10,970	4,000
1976	9,320	1,400	140	10,860	3,970
1977	9,270	1,280	130	10,680	3,900
1978	9,210	1,220	120	10,550	3,850
1979	9,160	1,210	120	10,490	3,830
1980	9,620	1,170	120	10,910	3,990
1981	10,750	1,100	110	11,960	4,370
1982	11,160	1,060	110	12,330	4,500
1983	11,010	990	100	12,100	4,420
1984	10,860	940	90	11,890	4,350
1985	10,750	900	90	11,740	4,290
1986	10,680	850	90	11,620	4,240
1987	7,230	820	80	8,130	2,970
1988	7,170	760	80	8,010	2,930
1989	7,130	700	70	7,900	2,880
1990	5,090	670	70	5,830	2,130
1991	5,030	640	60	5,730	2,090
1992	4,990	630	60	5,680	2,080
1993	4,950	600	60	5,610	2,050
1994	3,750	500	50	4,300	1,570
				TOTAL	88,760

TABLE D-2

## PROPANE SURPLUS IF THE APPLICATION WERE GRANTED

(BARRELS PER DAY)

YEAR	(1)			REMAINING SURPLUS	
	SURPLUS PRIOR TO CONSIDERING APPLICATION	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	ADJUSTED DOME AND PAN AMERICAN APPLICATION	FROM EXISTING PROCESSING PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES	INCLUDING FUTURE PROCESSING FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES
1969	13,000	13,000	-	13,000	13,000
1970	18,100	28,400	9,900	8,200	18,500
1971	19,900	34,500	12,200	7,800	22,300
1972	22,700	37,400	11,400	11,300	26,000
1973	23,600	38,400	11,200	12,400	27,200
1974	23,600	38,500	11,100	12,500	27,400
1975	24,500	38,600	11,000	13,500	27,600
1976	23,300	36,200	10,900	12,400	25,300
1977	29,800	41,500	10,700	19,100	30,800
1978	28,800	39,200	10,600	18,200	28,600
1979	28,700	37,800	10,500	18,200	27,300
1980	29,500	37,000	10,900	18,600	26,100
1981	29,600	36,200	12,000	17,600	24,200
1982	26,400	32,600	12,300	14,100	20,300
1983	20,900	27,200	12,100	8,800	15,100
1984	16,800	23,200	11,900	4,900	11,300
1985	16,100	22,500	11,700	4,400	10,800
1986	15,300	21,800	11,600	3,700	10,200
1987	12,200	18,700	8,100	4,100	10,600
1988	11,200	17,800	8,000	3,200	9,800
1989	9,100	15,600	7,900	1,200	7,700
1990	4,900	11,300	5,800	- 900	5,500
1991	3,000	9,300	5,700	- 2,700	3,600
1992	1,400	7,600	5,700	- 4,300	1,900
1993	- 200	5,900	5,600	- 5,800	300
1994	-2,000	4,300	5,400	- 7,400	-1,100

(1) FROM TABLE C-2

TABLE D-3

PROPANE SURPLUS REMAINING AT THE END OF THE 30-YEAR PERIOD  
 IF THE APPLICATION WERE GRANTED  
 (MILLIONS OF BARRELS)

	<u>FROM EXISTING PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES</u>	<u>INCLUDING FUTURE PLANT FACILITIES AND TWO YEARS GROWTH OF GAS RESERVES</u>
TOTAL RECOVERABLE PROPANE RESERVES	598	673
PRODUCTION DURING POSSIBLE TERM OF PERMIT APPLIED FOR - TO THE END OF 1994	479	562
PROPANE RESERVES REMAINING AT THE END OF 1994	119	111
TOTAL REQUIREMENTS INCLUDING EXISTING COMMITMENTS AND AMENDED APPLICATION	450	450
REQUIREMENTS DURING POSSIBLE TERM OF PERMIT APPLIED FOR - TO THE END OF 1994	405	405
REQUIREMENTS FOR REMAINDER OF 30-YEAR PERIOD (1995-1998)	45	45
SURPLUS	74	66

APPENDIX E

IN THE MATTER of The Gas Resources  
Preservation Act, 1956, being  
chapter 19 of the Statutes of  
Alberta, 1956; and

IN THE MATTER of a Permit to Dome  
Petroleum Limited and Pan American  
Canada Oil Company, Ltd.

PERMIT No. DP 68-1

WHEREAS Dome Petroleum Limited and Pan American Canada  
Oil Company, Ltd. (hereinafter called "the Permittees") have applied  
to the Oil and Gas Conservation Board for a permit pursuant to The  
Gas Resources Preservation Act, 1956, for the removal from the  
Province of propane produced at the gas processing plants herein-  
after referred to; and

WHEREAS the Board, upon inquiry into and hearing of the  
application, has found that the Permittees are persons who appear  
to the Board to have made arrangements to purchase or otherwise  
acquire property in propane within the Province and who propose  
to remove propane, or cause it to be removed, from the Province,  
and that the provisions of the said Act affecting the application  
have been complied with; and

WHEREAS the Board is of the opinion that the granting  
of this Permit for the removal of propane from the Province is  
in the public interest having regard to the present and future  
needs of persons within the Province, and to the established  
reserves and the trends in growth and discovery of the reserves  
of gas or propane in the Province; and

WHEREAS the Lieutenant Governor in Council has given his approval by Order in Council number O. C. /68, and dated

THEREFORE, the Oil and Gas Conservation Board, pursuant to the provisions of The Gas Resources Preservation Act, 1956, hereby grants a Permit to Dome Petroleum Limited and Pan American Canada Oil Company, Ltd., and hereby authorizes the removal of propane from the Province, subject to the regulations and orders made pursuant to the provisions of the said Act and to the terms and conditions prescribed in this Permit, as follows:

1. Subject to the conformity by the Permittees with the terms and conditions hereof, this Permit shall be operative for a term commencing on November 1, 1969, and ending on October 31, 1994.

2. The quantity of propane that may be removed from the Province pursuant to this Permit shall not exceed in any of the following years the maximum quantity prescribed for that year as follows:

<u>Year</u>	<u>Maximum Quantity</u>
November 1, 1969 to December 31, 1969	510,000 barrels
January 1, 1970 to December 31, 1970	3,600,000 barrels
January 1, 1971 to December 31, 1971	4,440,000 barrels
January 1, 1972 to December 31, 1972	4,150,000 barrels
January 1, 1973 to December 31, 1973	4,100,000 barrels
January 1, 1974 to December 31, 1974	4,060,000 barrels

<u>Year</u>	<u>Maximum Quantity</u>
January 1, 1975 to December 31, 1975	4,000,000 barrels
January 1, 1976 to December 31, 1976	3,970,000 barrels
January 1, 1977 to December 31, 1977	3,900,000 barrels
January 1, 1978 to December 31, 1978	3,850,000 barrels
January 1, 1979 to December 31, 1979	3,830,000 barrels
January 1, 1980 to December 31, 1980	3,990,000 barrels
January 1, 1981 to December 31, 1981	4,370,000 barrels
January 1, 1982 to December 31, 1982	4,500,000 barrels
January 1, 1983 to December 31, 1983	4,420,000 barrels
January 1, 1984 to December 31, 1984	4,350,000 barrels
January 1, 1985 to December 31, 1985	4,290,000 barrels
January 1, 1986 to December 31, 1986	4,240,000 barrels
January 1, 1987 to December 31, 1987	2,970,000 barrels
January 1, 1988 to December 31, 1988	2,930,000 barrels
January 1, 1989 to December 31, 1989	2,880,000 barrels
January 1, 1990 to December 31, 1990	2,130,000 barrels
January 1, 1991 to December 31, 1991	2,090,000 barrels
January 1, 1992 to December 31, 1992	2,080,000 barrels
January 1, 1993 to December 31, 1993	2,050,000 barrels
January 1, 1994 to October 31, 1994	1,310,000 barrels

3. The Permittees, for the purpose of this Permit, may purchase or otherwise acquire for removal from the Province, and there may be removed from the Province under the authority of this Permit, only propane obtained from the processing of gas

at the following gas processing plants:

<u>Plant Operator</u>		<u>Location</u>
Mobil Oil Canada, Ltd.	Carson Creek	Section 23, Township 61, Range 12, West of the 5th Meridian
Home Oil Company Limited	Carstairs	Section 3, Township 30, Range 2, West of the 5th Meridian
Alberta Natural Gas Company	Cochrane	Section 16, Township 26, Range 4, West of the 5th Meridian
Edmonton Liquid Gas Limited	Edmonton Liquid Gas	Section 4, Township 52, Range 24, West of the 4th Meridian
Texaco Exploration Company	Gilby	Section 22, Township 40, Range 3, West of the 5th Meridian
Hudson's Bay Oil and Gas Company Limited	Kaybob South	Section 1, Township 62, Range 20, West of the 5th Meridian
Pan American Petroleum Corporation	Lobstick- Easyford	Section 17, Township 50, Range 50, West of the 5th Meridian
Goliad Ltd.	Pembina	Section 24, Township 48, Range 7, West of the 5th Meridian
Provo Gas Producers Limited	Provost	Section 19, Township 36, Range 5, West of the 4th Meridian
Dome Petroleum Limited	Vulcan	Section 24, Township 15, Range 22, West of the 4th Meridian

4. (1) If, during the term of the Permit, the Permittees, or either of them, gives or receives notice of cancellation of any contract under which they, or either of them, purchase or

acquire propane produced at a processing plant named in clause 3 of these terms and conditions, they shall forthwith notify the Board of the notice.

(2) Upon notification by the Permittees pursuant to subclause (1) or one month before cancellation of a contract pursuant to a notice referred to in subclause (1), whichever is later, the Board, by stipulation, shall reduce the volumes of propane that may be removed from the Province pursuant to this Permit during the balance of the term of the Permit by the volumes that the Permittees would have purchased or acquired under the contract if it had not been cancelled; but if the Permittees, before the issue of the stipulation, satisfy the Board that they have made an arrangement whereby they will purchase or acquire volumes of propane at any processing plant named in clause 3 of these terms and conditions to replace in whole or in part the propane that they would have purchased or acquired under the cancelled contract, and where the arrangement is to purchase or acquire replacement volumes at a processing plant other than that at which the propane covered by the cancelled contract was obtained, that the change in the source of the propane will not prejudice any public interest, then the volumes of propane that may be removed from the Province pursuant to this Permit shall not be reduced or shall be reduced only to the extent that the volumes of propane that the Permittees would have purchased or acquired under the cancelled contract have not been replaced, as the case may be.

5. Propane produced at processing plants other than those named in clause 3 of these terms and conditions acquired in Alberta by the Permittees may be removed from the Province under the authority of this Permit

(a) over a period of not more than three months in any year, and

(b) in daily average volumes over the period not exceeding one-tenth of the volume that could be removed from the Province pursuant to this Permit if the annual volume were divided equally among the days in the year,

in substitution for equal volumes of propane produced at the plants named in said clause 3, and the Permittees shall notify the Board of the substitution within ten days of its commencement.

6. The effective commencement of removal of propane from the Province pursuant to this Permit shall be on or before November 1, 1970, unless, upon application by the Permittee, a later date is stipulated by the Board.

7. (1) All propane removed from the Province pursuant to this Permit shall be measured by or on behalf of the Permittees within the Province and in a manner satisfactory to the Board.

(2) The measurements required by this clause shall be reported monthly to the Board in a manner approved by the Board.

8. (1) The Permittees shall supply propane at a reasonable price to any community or consumer within the Province that is willing to take delivery of propane at a gas processing plant named in clause 3 of these terms and conditions and that, in the opinion of the Board, can reasonably be supplied by the Permittees.

(2) In the event that propane is removed from the Province pursuant to this Permit by pipe line, the Permittees shall supply propane at a reasonable price to any community or consumer within the Province that is willing to take delivery of propane at a point on the pipe line transmitting the propane within the Province, and that, in the opinion of the Board, can reasonably be supplied by the Permittee.

9. If any community or consumer is willing to take delivery of propane pursuant to clause 8 of these terms and conditions, and agreement on the price to be paid for the propane cannot be reached, the price to be paid shall be determined by the Public Utilities Board on the application of an interested party.

10. Notwithstanding the provisions hereof, the Permittees shall comply with the provisions of any Act, competent regulation, order or direction governing the production, conservation, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of propane within the Province.

## OIL AND GAS CONSERVATION BOARD

G. W. Govier  
Chairman





